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UNITED STATES DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, Secretary

BUREAU OF FISHERIES
LES E. JACKSON, Acting Commissioner

Administrative Report No. 42

GOVERNMENT PUBLICATIONS
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PROPAGATION AND DISTRIBUTION OF FOOD FISHES

FISCAL YEAR 1940

By GLEN C. LEACH, M. C. JAMES
and E. J. DOUGLASS

APPENDIX IV TO REPORT OF COMMISSIONER OF FISHERIES
FOR THE FISCAL YEAR 1940

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ADMINISTRATIVE REPORT SERIES

Since the advent of the Administrative Report Series, considerable confusion has arisen concerning its system of numbering the separates composing it. Inasmuch as the Reports of the Divisions vary in order from year to year, many have found their designations as "Appendix No. I, II, III, or IV" very confusing. To relieve this, it has been decided to number them as "Administrative Report No.—." Inasmuch as 20 separates had already been printed in this series before starting the numbers, it was deemed advisable to begin the numbering with Administrative Report No. 21. Of course, numbers cannot be printed on those already off the press, but for the information of those who wish to know what the first 20 were, they are numbered for filing purposes as follows:

No. 1. Report, Commissioner of Fisheries, 1931.
No. 2. Alaska Fishery and Fur-Seal Industries, 1930.
No. 3. Fishery Industries of the United States, 1930.
No. 4. Progress in Biological Inquiries, 1930.
No. 5. Propagation and Distribution of Food Fishes, 1931.
No. 6. Report, Commissioner of Fisheries, 1932.
No. 7. Alaska Fishery and Fur-Seal Industries, 1931.
No. 8. Fishery Industries of the United States, 1931.
No. 9. Progress in Biological Inquiries, 1931.
No. 10. Propagation and Distribution of Food Fishes, 1932.
No. 11. Alaska Fishery and Fur-Seal Industries, 1932.
No. 12. Progress in Biological Inquiries, 1932.
No. 13. Fishery Industries of the United States, 1932.
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No. 15. Fishery Industries of the United States, 1933.
No. 16. Alaska Fishery and Fur-Seal Industries, 1933.
No. 17. Progress in Biological Inquiries, 1933.
No. 18. Propagation and Distribution of Food Fishes, 1934.
No. 19. Alaska Fishery and Fur-Seal Industries, 1934.
No. 20. Fishery Industries of the United States, 1934.

Note that the last Commissioner's Report was for 1932. Since then its place has been taken by a reprint from the Report of the Secretary of Commerce under the title "Bureau of Fisheries." Inasmuch as it is no longer a Bureau publication, it is not numbered; but it will be supplied to any who request the Report of the Commissioner for any year since 1932.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES, FISCAL YEAR 1940[1]

By Glenn C. Leach, *Chief*, M. C. James, *Assistant Chief*, and E. J. Douglass, *Superintendent of Distribution, Division of Fish Culture*

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INTRODUCTION

During the fiscal year 1940 the fish and eggs released from Federal fish hatcheries totaled approximately 617,300,000 less than in the previous year. The 1940 output amounted to 7,407,246,940; the reduction being 7.7 percent.

There was no curtailment of activities to account for this recession. However, with certain groups of fish the hatchery activities are governed by the same factors which cause fluctuations in the natural populations. Hence, hatchery production cannot be geared to a definite predetermined level, and all fish-culturists recognize that hatchery output will vary to a moderate degree from year to year. The nature of these fluctuations is discussed elsewhere in this report.

The older conception that artificial propagation and distribution of fish is a guaranteed stimulus for greater abundance and an assurance against depletion has been modified. The current attitude is to view the hatchery production as a supplement to natural production, or as a raw material upon which management practices can be based. This view imposes an obligation to give more careful consideration to all proposals for the extension of fish-cultural work into new fields, and to review the status of current activities. By concentrating hatchery production in comparatively restricted areas, positive results can generally be achieved. The cost of such local benefits may be excessive and judgment must be based upon the benefits accruing to fish populations as a whole.

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[1] Administrative Report No. 42, Appendix IV to the Report of the U. S. Commissioner of Fisheries for the fiscal year 1940. Approved for publication May 19, 1941.

The basic principles of animal husbandry are naturally applicable to the breeding of fish. Increased attention has therefore been given to selection of hatchery breeding stock and to the development of suitable diets. Sanitation has been emphasized as one of the best means of preventing undue mortality, and experimentation, with refinements in technique and equipment, has been conducted.

The emphasis during the year under review has been in the direction of improving existing hatcheries as to plant, equipment, and operating efficiency, with less thought to any program of expansion.

SPECIES PROPAGATED

The Bureau hatcheries propagated, or handled in salvage activities, 50 different species. The larger percentage of this list covered the fresh-water and anadromous types, although the salt-water groups accounted for the major part of the output numerically.

Dolly Varden trout appeared in the listing for the first time in several years. There has been relatively little change, however, in the category of species propagated, because of the fact that the list already covers practically all forms which are readily amenable to methods of artificial culture.

Several varieties, such as the yellow or white perch, are propagated as a side line at hatcheries primarily intended for other species. These perch would not be handled unless the facilities were available during the off season on the hatching of shad.

The selection of the game species to be propagated at each of the hatcheries has been predicated upon a demand, which is an outgrowth of the geographical range of species. This takes into consideration the fact that many species have been transplanted beyond their normal range. Very little work of transplanting has been undertaken in recent years because of the belief that the fish population of the country has been quite thoroughly dispersed into the zones to which the species can be adapted. There is further evidence of the fact that distinctions between game and nongame species have largely broken down. Such distinctions are recognizable now only in the State fish and game laws, which frequently make an arbitrary separation of the two groups.

Catfishes (*Siluridae*):
  Yellow cat (*Opladelus olivaris*).
  Spotted channel cat (*Ictalurus punctatus*).
  Bullhead (*Ameiurus nebulosus*).
Buffalofish (*Catostomidae*): Common buffaloes (*Ictiobus* sp.).
Shad and herring (*Clupeidae*):
  Shad (*Alosa sapidissima*).
  Glut herring (*Pomolobus aestivalis*).
Whitefishes and Lake herring (*Coregonidae*):
  Common whitefish (*Coregonus clupeaformis*).
  Lake herring, cisco (*Leucicthys* sp.).
Salmons and trouts (*Salmonidae*):
  King, chinook, or quinnat salmon (*Oncorhynchus tschawytscha*).
  Chum salmon (*Oncorhynchus keta*).
  Coho, or silver salmon (*Oncorhynchus kisutch*).

  - Red, sockeye, or blueback salmon (*Oncorhynchus nerka*).
  - Pink, or humpback salmon (*Oncorhynchus gorbuscha*).
  - Landlocked sockeye salmon, silver trout (*Oncorhynchus kennerlyi*).
  - Steelhead trout (*Salmo gairdnerii*).
  - Atlantic salmon (*Salmo salar*).
  - Landlocked salmon (*Salmo sebago*).
  - Golden trout (*Salmo agua-bonita*).
  - Rainbow trout (*Salmo irideus*).
  - Cut-throat trout, blackspotted trout (*Salmo clarkii*).
  - Brown, or Loch Leven trout (*Salmo fario* var.).
  - Lake trout, mackinaw trout (*Cristivomer namaycush*).
  - Brook trout (*Salvelinus fontinalis*).
  - Dolly Varden trout (*Salvelinus malma*).
- Grayling (*Thymallidae*): Montana grayling (*Thymallus montanus*).
- Pikes (*Esocidae*): Pike and pickerel (*Esox* sp.).
- Sunfishes (*Centrarchidae*):
  - Crappie (*Pomoxis annularis* and *P. sparoides*).
  - Largemouth black bass (*Micropterus salmoides*).
  - Smallmouth black bass (*Micropterus dolomieu*).
  - Kentucky bass (*Micropterus pseudoplites*).
  - Rock bass (*Ambloplites rupestris*).
  - Warmouth bass (*Chaenobryttus gulosus*).
  - Bluegill sunfish (*Lepomis incisor*).
  - Green sunfish (*Lepomis cyanellus*).
  - Redbreasted bream (*Lepomis auritus*).
  - Red-eared sunfish (*Lepomis heros*).
  - Common sunfish (*Lepomis gibbosus*).
- Mojarras de rio (*Cichlidae*).
  - Rio Grande perch (*Herichthys cyanoguttatus*).
- Perches (*Percidae*):
  - Pikeperch (*Stizostedion vitreum*).
  - Yellow perch, ringed perch (*Perca flavescens*).
- White basses (*Serranidae*):
  - White bass (*Roccus chrysops*).
  - Striped bass (*Roccus saxatilis*).
  - White perch (*Morone americana*).
- Drums (*Sciaenidae*): Fresh-water drum, sheepshead (*Aplodinotus grunniens*).
- Cods (*Gadidae*):
  - Cod (*Gadus callarias*).
  - Haddock (*Melanogrammus aeglefinus*).
  - Pollock (*Pollachius virens*).
- Mackerel (*Scombridae*): Common mackerel (*Scomber scombrus*).
- Flounders (*Pleuronectidae*): Winter flounder (*Pseudopleuronectes americanus*).
- Lobster (*Homaridae*): Lobster (*Homarus americanus*).

Summary, by species, of the output of fish and fish eggs during the fiscal year ended June 30, 1940

Species	Eggs	Fry	Fingerlings	Total
Catfish		39, 000	2, 956, 715	2, 995, 715
Buffalofish	95, 872, 250		437, 600	96, 309, 850
Shad		42, 105, 000	99, 500	42, 204, 500
Whitefish	2, 000, 000	5, 660, 000		7, 660, 000
Glut herring		170, 000		170, 000
Lake herring		420, 000		420, 000
Striped bass		5, 917, 000		5, 917, 000
Chinook salmon	2, 340, 000	22, 797, 700	16, 309, 875	41, 447, 575
Chum salmon	795, 000	4, 437, 680	250, 200	5, 482, 880
Humpback salmon		230, 790	237, 000	467, 790
Silver salmon			1, 493, 765	1, 493, 765
Sockeye salmon	116, 380		2, 279, 125	2, 395, 505
Sockeye salmon, landlocked	548, 950		650, 585	1, 199, 535
Landlocked salmon			15, 645	15, 645
Steelhead trout	138, 550		1, 829, 935	1, 968, 485
Rainbow trout	16, 043, 060	411, 840	11, 146, 405	27, 601, 305
Blackspotted trout	32, 594, 080	9, 363, 330	9, 229, 205	51, 186, 615
Loch Leven trout	75, 640	101, 250	3, 152, 815	3, 329, 705
Lake trout	599, 500	1, 773, 500	264, 660	2, 637, 660
Brook trout	13, 236, 560	1, 468, 760	11, 835, 500	26, 540, 820
Golden trout			19, 855	19, 855
Dolly Varden trout	43, 750			43, 750
Grayling	4, 349, 000		255, 245	4, 604, 245

Summary, by species, of the output of fish and fish eggs during the fiscal year ended June 30, 1940—Continued

Species	Eggs	Fry	Fingerlings	Total
Pike and pickerel	6, 782, 810	940, 140	8, 910	7, 731, 860
Crappie			1, 683, 595	1, 683, 595
Black bass, largemouth		2, 884, 100	7, 336, 455	10, 220, 555
smallmouth		1, 065, 750	485, 675	1, 551, 425
Kentucky bass		10, 000	28, 295	38, 295
Rock bass			208, 985	208, 985
Warmouth bass			37, 545	37, 545
Sunfish			10, 067, 925	10, 067, 925
Rio Grande perch			104, 660	104, 660
Pikeperch	1, 378, 360	8, 750, 000		10, 128, 360
Yellow perch		243, 082, 000	70, 375	243, 152, 375
Fresh-water drum			5, 600	5, 600
White bass			30, 745	30, 745
White perch		2, 280, 000	1, 845	2, 281, 845
Mackerel		8, 277. 000		8, 277, 000
Cod	2, 613, 068, 110	191. 980, 100		2, 805, 048, 210
Haddock	1, 066, 164, 500			1, 066, 164, 500
Flatfish	6, 607, 000	761, 525, 280		768, 132, 280
Pollock	1, 962, 705, 490	174, 382, 490		2, 137, 087, 980
Lobster	600, 000	8, 084, 000		8, 684, 000
Miscellaneous fishes			497, 000	497, 000
Total	5, 826, 058, 990	1, 498, 156, 710	83, 031, 240	7, 407, 246, 940

PRODUCTION

As stated in the introduction, there was a reduction of 7.7 percent in the 1940 distribution. Analysis of the 1939 and 1940 totals, however, shows that the difference was due to local conditions, and was restricted in its effect.

A reduction of 352,000,000 fish and eggs in 1940 was traceable to a change in the operation of the Put in Bay (Ohio) station, which produced that number of pikeperch and whitefish in 1939, then operated jointly with the State of Ohio. In 1940 this station was transferred to the full custody of the State, and the Bureau discontinued listing the output.

Also, the drop can be attributed in part to a shortage in the production of cod, haddock, and flounders. Activity with this group is governed by weather conditions, and the intensity of local commercial operations from which the eggs are obtained. Both of these factors were adverse during the winter of 1939–40.

As a matter of fact, 24 species were distributed in increased numbers, among them 6 species of trout, 1 variety of Pacific salmon, shad, striped bass, buffalofish, and lobster. There was a reduction of approximately 2,410,000 in the output of the black basses, which also are subject to adverse weather conditions during the spawning season. About 45 species were handled at the various hatcheries, exclusive of rescued fishes, during the year.

Despite the reduction in total ouptut, there was little change in the actual number of the fingerlings and larger sizes of game fish. It is gratifying to note that the production of game and pan species amounted to 151,114,500; an actual, as well as proportional increase. These forms comprised 2.04 percent of the total output, but it must be recognized that practically all of the species propagated are sought for recreation at certain times or places.

There was no large increase in production facilities, although increase in the number and size of ponds at some stations provided additional hatching and rearing facilities. A normal carry-over of fish remained on hand at the end of the year to provide for the distribution of large fingerlings and legal-sized fish during 1941. The new hatchery at Inks Dam, Tex., constructed with the aid of the N. Y. A., entered into production, distributing a moderate number of bass and pondfish in the waters of the Lower Colorado flood control impoundments.

CONSTRUCTION ACTIVITIES

The major part of fish-hatchery construction during the year was in continuation of projects previously started. The 1940 appropriation carried funds for the establishment of hatcheries in Illinois and New Jersey, a substation in Maine, and/or the enlargement of the East Orland (Maine) Hatchery. Difficulty in selecting a site, and absence of State enabling legislation, prevented any action in Illinois. In New Jersey it was not possible to obtain a suitable site at a price low enough to permit adequate development.

A site near Salem, Maine, was selected for a small trout-rearing and bass-cultural unit, and the title was cleared late in the year. Construction of this unit was not started prior to June 30. At the East Orland Station, buildings and ponds were rehabilitated and provision was made for resumption of the propagation of Atlantic salmon. All appropriations for the above projects were continued available, and none of the projects were abandoned.

At the start of the year, previously approved hatchery projects at Hebron, Ohio, New London, Minn., and Farlington, Kans., entered a more active phase of construction. At the two former, appropriated funds were supplemented by W. P. A. allotments, and a large work camp was assigned to New London. Construction of the Kansas project was retarded by adverse weather conditions, and none of the establishments were developed to the point where fish-cultural work could be undertaken by the close of the year.

Toward the end of the 1939 fiscal year, allotments of P. W. A. funds were made available which provided $30,000 for the construction of a bass hatchery at Carbon Hill, Ala., and $60,000 for the development of fish-cultural facilities in Yellowstone Park. Of the latter sum, $20,000 was reallocated for the construction of the Glacier National Park hatchery at Creston, Mont. With the exception of the Yellowstone Park project, these jobs were nearing completion at the end of the year. The construction of the Glacier Park hatchery was taken over by the Bureau when the project was in an incomplete status. This work was initiated by the National Park Service, and upon the exhaustion of funds available to that agency it was necessary for the Bureau to assume responsibility for completion.

W. P. A. allotments totaling $188,047 were allocated to 20 fish-cultural stations for repairs, improvements, and further developmental work. Among the projects undertaken was the construction of four rearing ponds at Moorefield, W. Va., to serve as an auxiliary to the Leetown (W. Va.) station. This allotment supplemented the regular construction appropriations. Seventeen projects of a similar nature, which had been financed by W. P. A. allotments during the previous year, were continued in operation until these funds were expended. In addition, several W. P. A. projects were approved under State quotas covering similar work. The flexibility permitted under the procedure of transferring W. P. A. funds to the Bureau has been of great value in meeting unforeseen contingencies at the numerous field stations. There follows a listing of the Federal W. P. A. projects operated during the year. Among the larger projects under State quota was one providing for a continuation of the development of the bass hatchery at Arcadia, R. I.

Stations receiving W. P. A. allotments during the fiscal year 1940

Location	Amount of W. P. A. project
Florida: Welaka	$10,000
Georgia:	
Cohutta	13,054
Warm Springs	10,000
Indiana: Rochester	10,000
Iowa: Fairport	2,500
Louisiana: Natchitoches	5,000
Maine: East Orland	4,000
Michigan: Northville	5,000
Montana: Creston	15,000
New Hampshire: Nashua	10,000
New Mexico:	
Dexter	6,890
Santa Rosa	7,978
New York: Cortland	$5,000
Ohio: Hebron	54,720
Pennsylvania: Lamar	10,000
Tennessee: Erwin	1,510
Texas: Fort Worth	5,000
Washington: Birdsview	2,500
West Virginia:	
Moorefield	6,500
White Sulphur Springs	3,395
Total	188,047

In February 1940, a transfer of $40,000 was made by the Bureau of Reclamation to provide for the construction of a pondfish hatchery at Austin, Tex. The production from this unit is destined to supplement that from the Inks Dam (Tex.) hatchery in stocking the series of reservoirs developed by the Lower Colorado Authority. At the close of the year the active phase of the construction had been barely started, though equipment and materials were being procured. The site for this unit was donated by the city of Austin.

COOPERATION WITH OTHER CONSERVATION AGENCIES

The Division of Fish Culture is vitally concerned in placing its products—fish and fish eggs—in environments where the greatest dividends will be derived from stocking. Because the Bureau's staff of biologists has been entirely inadequate to conduct surveys of all the inland waters of the United States, fish applications from individuals and clubs are submitted to more than 20 State fish and game commissions for approval before stocking the waters with the species requested. In some States the authorities stipulate the species, number, and size that will give best results; while in others the stocking programs have been formulated and the combined output of the State and Federal hatcheries has been budgeted to conform to these programs. The exchange of eggs and fish, especially trout and related species, has been of mutual benefit in a number of States.

The Bureau continued to cooperate with the National Park Service in the restocking of waters under its control. It appears that an all-time record will be established with regard to the number of black-spotted trout eggs collected from waters in Yellowstone Park this season.

In the Tennessee Valley area, three-way agreements between the Bureau of Fisheries, the Tennessee Valley Authority, and the States of Alabama, Tennessee, and North Carolina have been made effective. The Tennessee Valley Authority completed a pondfish hatchery, having a water area of 111 acres, on the Elk River in Alabama. The personnel assigned to that hatchery is now collecting brood stock and treating the pond bottoms to reduce the loss of water through seepage. The hatchery operated at Norris, Tenn., was enlarged during the year. The State conservation departments will distribute the fish produced at these units for the stocking of waters in that part of the Tennessee Valley area within their respective boundaries.

The New Jersey Board of Fish and Game Commissioners donated the services of its staff for the surveying of potential Federal pondfish hatchery sites in New Jersey. Further assistance was received from various State agencies in setting up W. P. A. projects to cover extensive construction programs at Federal hatcheries.

In view of the tremendous amount of angling in the waters within the national forests, there has been close cooperation between the Forest Service, of the Department of Agriculture, and the Bureau in an effort to maintain good fishing in those areas. More than 21,140,940 fish were assigned to the Forest Service for the stocking of suitable waters during the past year. Trout-rearing units were operated in the Chattahoochee, Nantahala, Pisgah, Allegheny, Huron, Marquette, Chequamegon, and Superior National Forests, and approximately 1½ million trout were reared to large fingerling, or legal size before liberation. A tabulation of these assignments follows:

Fish planted in Forest Service waters, by regions, fiscal year 1940

Forest and species	State	Fry	Fingerlings, etc.	Total
REGION 1				
Beaverhead: Blackspotted trout	Montana		230,650	230,650
Bitter Root:	Montana.			
Golden trout			2,000	2,000
Grayling			21,450	21,450
Rainbow trout			4,480	4,480
Cabinet: Blackspotted trout	Montana		114,000	114,000
Coeur d'Alene:	Idaho.			
Blackspotted trout		20,400	297,525	317,925
Brook trout			25	25
Rainbow trout			65,000	65,000
Custer:	Montana.			
Grayling			15,000	15,000
Rainbow trout			37,240	37,240
Deerlodge:	Montana.			
Blackspotted trout			96,000	96,000
Brook trout			49,475	49,475
Grayling			9,000	9,000
Rainbow trout			30,000	30,000
Gallatin:	Montana.			
Blackspotted trout			322,000	322,000
Brook trout			21,260	21,260
Golden trout			6,000	6,000
Grayling			38,600	38,600
Rainbow trout			135,000	135,000
Helena: Blackspotted trout	Montana		95,000	95,000
Kaniksu:	Idaho.			
Blackspotted trout			110,300	110,300
Brook trout			62,720	62,720
Rainbow trout			10,775	10,775
Lewis and Clark: Blackspotted trout	Montana		26,800	26,800
Lolo:	Montana.			
Blackspotted trout			108,100	108,100
Rainbow trout			3,200	3,200
St. Joe: Rainbow trout	Idaho		8,000	8,000

Fish planted in Forest Service waters, by regions, fiscal year 1940—Continued

Forest and species	State	Fry	Fingerlings, etc.	Total
REGION 2				
Arapaho:				
Blackspotted trout			37,000	37,000
Brook trout			104,600	104,600
Rainbow trout			20,000	20,000
Steelhead trout			18,300	18,300
Black Hills:	South Dakota.			
Blackspotted trout			64,000	64,000
Brook trout			178,510	178,510
Loch Leven trout			600	600
Rainbow trout			130,280	130,280
Cochetopa:	Colorado.			
Blackspotted trout			165,000	165,000
Brook trout			48,000	48,000
Rainbow trout			28,000	28,000
Gunnison:	Colorado.			
Blackspotted trout			150,000	150,000
Brook trout			91,600	91,600
Rainbow trout			135,000	135,000
Harney: Rainbow trout	South Dakota		40,650	40,650
Holy Cross:	Colorado.			
Blackspotted trout			71,000	71,000
Brook trout			119,280	119,280
Rainbow trout			50,000	50,000
Medicine Bow:	Wyoming.			
Blackspotted trout			142,380	142,380
Rainbow trout			267,735	267,735
Montezuma:	Colorado.			
Blackspotted trout			51,000	51,000
Brook trout			68,000	68,000
Rainbow trout			83,000	83,000
Pike:	Colorado.			
Blackspotted trout			52,500	52,500
Brook trout			82,860	82,860
Loch Leven trout			15,000	15,000
Rainbow trout			90,800	90,800
Rio Grande:	Colorado.			
Blackspotted trout			297,300	297,300
Brook trout			389,000	389,000
Rainbow trout			167,200	167,200
Roosevelt:	Colorado.			
Blackspotted trout			20,160	20,160
Brook trout			59,000	50,000
Rainbow trout			101,200	101,200
Routt:	Colorado.			
Blackspotted trout			59,180	59,180
Brook trout			10,200	10,200
Rainbow trout			7,500	7,500
San Isabel:	Colorado.			
Blackspotted trout			10,000	10,000
Brook trout			480	480
Shoshone:	Wyoming.			
Blackspotted trout			746,000	746,000
Brook trout			97,250	97,250
Rainbow trout			37,500	37,500
Uncompahgre:	Colorado.			
Blackspotted trout			20,000	20,000
Brook trout			77,400	77,400
Washakie:	Wyoming.			
Blackspotted trout			32,640	32,640
Brook trout			43,220	43,220
Rainbow trout			3,900	3,900
White River:	Colorado.			
Blackspotted trout			119,585	119,585
Brook trout			32,000	32,000
Rainbow trout			42,500	42,500
REGION 3				
Carson:	New Mexico.			
Blackspotted trout			92,000	92,000
Rainbow trout			4,500	4,500
Cibola:	New Mexico.			
Catfish			20	20
Sunfish			16,000	16,000
Coconino: Black bass, largemouth	Arizona		20,000	20,000
Gila:	New Mexico.			
Black bass:				
Largemouth			20,000	20,000
Smallmouth			15,000	15,000
Crappie			5,000	5,000
Lincoln: Crappie	New Mexico		1,700	1,700
Santa Fe: Black bass, smallmouth	New Mexico		500	500

Fish planted in Forest Service waters, by regions, fiscal year 1940—Continued

Forest and species	State	Fry	Fingerlings, etc.	Total
REGION 4				
Ashley:	Utah.			
Blackspotted trout			53, 760	53, 760
Rainbow trout			19, 200	19, 200
Boise: Rainbow trout	Idaho		30, 000	30, 000
Cache:	Utah.			
Blackspotted trout			15, 840	15, 840
Brook trout			145, 790	145, 790
Rainbow trout			3, 600	3, 600
Challis:	Idaho.			
Blackspotted trout			10, 240	10, 240
Rainbow trout			72, 140	72, 140
Dixie: Rainbow trout	Utah		1, 000	1, 000
Fish Lake:	Utah.			
Blackspotted trout			5, 000	5, 000
Rainbow trout			6, 000	6, 000
Humboldt:	Nevada.			
Blackspotted trout			57, 000	57, 000
Brook trout			25, 000	25, 000
Rainbow trout			44, 520	44, 520
La Sal: Rainbow trout	Utah		20, 000	20, 000
Lemhi: Rainbow trout	Idaho		44, 820	44, 820
Manti:	Utah.			
Blackspotted trout			23, 600	23, 600
Brook trout			12, 780	12, 780
Rainbow trout			22, 000	22, 000
Minidoka:	Idaho.			
Blackspotted trout			10, 000	10, 000
Rainbow trout			48, 000	48, 000
Nevada: Rainbow trout	Nevada		69, 545	69, 545
Salmon:	Idaho.			
Blackspotted trout			163, 940	163, 940
Golden trout			22, 280	22, 280
Rainbow trout			374, 080	374, 080
Sawtooth:	Idaho.			
Blackspotted trout			50, 500	50, 500
Brook trout			80, 000	80, 000
Landlocked sockeye salmon			294, 400	294, 400
Rainbow trout			106, 900	106, 900
Targhee:	Idaho.			
Blackspotted trout			41, 000	41, 000
Brook trout			5, 000	5, 000
Teton:	Wyoming.			
Blackspotted trout		212, 000	221, 090	433, 090
Brook trout		187, 500	132, 000	319, 500
Lake trout			13, 700	13, 700
Toiyabe: Rainbow trout	Nevada		27, 640	27, 640
Uinta:	Utah.			
Blackspotted trout			73, 110	73, 110
Rainbow trout			9, 000	9, 000
Wasatch:	Utah.			
Blackspotted trout			169, 860	169, 860
Brook trout			44, 800	44, 800
Rainbow trout			46, 120	46, 120
Wyoming:	Wyoming.			
Blackspotted trout			70, 040	70, 040
Rainbow trout			2, 785	2, 785
REGION 6				
Columbia:	Washington.			
Blackspotted trout			262, 000	262, 000
Brook trout			417, 700	417, 700
Chinook salmon		932, 700	229, 330	1, 162, 030
Rainbow trout			414, 335	414, 335
Mount Baker:	Washington.			
Blackspotted trout			322, 450	322, 450
Rainbow trout			132, 500	132, 500
Olympic: Rainbow trout	Washington		24, 560	24, 560
REGION 7				
Allegheny:	Pennsylvania.			
Brook trout			200, 000	200, 000
Loch Leven trout			10, 000	10, 000
Rainbow trout			58, 800	58, 800
George Washington:	Virginia.			
Black bass, largemouth			2, 240	2, 240
Brook trout			12, 715	12, 715
Rainbow trout			20, 515	20, 515
Sunfish			3, 000	3, 000
Jefferson:	Virginia.			
Brook trout			47, 640	47, 640
Rainbow trout			52, 595	52, 595

Fish planted in Forest Service waters, by regions, fiscal year 1940—Continued

Forest and species	State	Fry	Fingerlings, etc.	Total
REGION 7—Continued				
Monongahela: Black bass:	West Virginia.			
Largemouth			1,325	1,325
Smallmouth			750	750
White Mountain: Brook trout	New Hampshire	25,000	38,605	63,605
REGION 8				
Apalachicola:	Florida.			
Crappie			800	800
Sunfish			14,200	14,200
Black Warrior: Sunfish	Alabama		8,000	8,000
Chattahoochee:	Georgia.			
Black bass, largemouth			640	640
Brook trout			50,475	50,475
Rainbow trout			44,025	44,025
Sunfish			4,000	4,000
Cherokee:	Tennessee.			
Brook trout			281,990	281,990
Rainbow trout			478,235	478,235
Sunfish			1,620	1,620
Conecuh:	Alabama.			
Black bass, largemouth			6,400	6,400
Sunfish			3,850	3,850
De Soto:	Mississippi.			
Black bass, largemouth			1,500	1,500
Sunfish			7,500	7,500
Francis Marion: Black bass, largemouth	South Carolina		20,000	20,000
Holley Springs: Sunfish	Mississippi		7,000	7,000
Kisatchie:	Louisiana.			
Black bass, largemouth			59,750	59,750
Sunfish			210,000	210,000
Nantahala:	North Carolina.			
Brook trout		50,000	32,230	82,230
Loch Leven trout			240	240
Rainbow trout		35,000	16,960	51,960
Ocala:	Florida.			
Black bass, largemouth		96,000	156,885	252,885
Sunfish			208,500	208,500
Ouachita:	Arkansas.			
Black bass:				
Largemouth			15,000	15,000
Smallmouth		20,000		20,000
Sunfish			400	400
Ozark: Black bass, smallmouth	Arkansas		24,000	24,000
Pisgah:	North Carolina.			
Brook trout			8,785	8,785
Loch Leven trout			9,910	9,910
Rainbow trout			31,090	31,090
Sumpter:	South Carolina.			
Brook trout			1,150	1,150
Rainbow trout			24,000	24,000
Talladega:	Alabama.			
Black bass, largemouth			9,400	9,400
Sunfish			5,000	5,000
Unaka: Rainbow trout	North Carolina		2,100	2,100
REGION 9				
Chequamegon:	Wisconsin.			
Black bass, largemouth			2,000	2,000
Brook trout			13,200	13,200
Crappie			400	400
Loch Leven trout			7,500	7,500
Sunfish			3,975	3,975
Chippewa:	Minnesota.			
Black bass, largemouth			75	75
Brook trout			900	900
Crappie			645	645
Rainbow trout			11,050	11,050
Clark:	Missouri.			
Black bass:				
Largemouth		30,000	40,000	70,000
Smallmouth		60,000		60,000
Catfish			1,000	1,000
Crappie			810	810
Sunfish			3,550	3,550

Fish planted in Forest Service waters, by regions, fiscal year 1940—Continued

Forest and species	State	Fry	Fingerlings, etc.	Total
REGION 9—Continued				
Gardner:	Missouri.			
Black bass, largemouth			2, 700	2, 700
Rock bass			1, 700	1, 700
Sunfish			750	750
Hiawatha: Sunfish	Michigan		33, 600	33, 600
Huron:	Michigan.			
Black bass, largemouth			1, 750	1, 750
Sunfish			6, 440	6, 440
Manistee:	Michigan.			
Black bass:				
Largemouth			19, 125	19, 125
Smallmouth			2, 475	2, 475
Rainbow trout			29, 600	29, 600
Sunfish			2, 500	2, 500
Mark Twain:	Missouri.			
Black bass:				
Largemouth			74, 150	74, 150
Smallmouth			24, 000	24, 000
Catfish			500	500
Crappie			240	240
Rainbow trout			11, 895	11, 895
Sunfish			1, 500	1, 500
Marquette:	Michigan.			
Black bass, largemouth			2, 900	2, 900
Brook trout			48, 000	48, 000
Loch Leven trout			2, 500	2, 500
Sunfish			525	525
Yellow perch			2, 500	2, 500
Nicolet:	Wisconsin.			
Brook trout			143, 600	143, 600
Rainbow trout			22, 600	22, 600
Ottawa:	Michigan.			
Brook trout			26, 775	26, 775
Sunfish			4, 200	4, 200
Superior:	Minnesota.			
Brook trout			682, 000	682, 000
Crappie			1, 175	1, 175
Lake trout		351, 000	20, 000	371, 000
Loch Leven trout			108, 000	108, 000
Pikeperch		4, 140, 000		4, 140, 000
Pike and pickerel		100, 000		100, 000
Rainbow trout			51, 150	51, 150
Sunfish			18, 980	18, 980

The Bureau of Reclamation has continued its efforts to preserve the runs of salmon in the Columbia and Sacramento Rivers, where the survival of this species is threatened by the construction of huge dams. In connection with this work, one of the four salmon hatcheries originally contemplated has been partially completed and placed in limited operation.

In organizing the various cooperative procedures with the States, several general conferences with State conservation officials have been held in connection with conferences and meetings concerned with wildlife programs. In addition, there has been frequent individual contact with various State departments in an effort to settle specific problems. As an example, there may be mentioned the discussions with the Missouri Conservation Department looking toward the zoning of the State for fish-distribution purposes.

As an indication of the magnitude of assignments to Federal waters under the jurisdiction of agencies other than the Forest Service, there follows a tabulated statement in which it will be noted that six different agencies were the beneficiaries of such assignments, and some stocking also was carried on in waters under the control of several other Federal organizations:

Fish and fish eggs planted in Federal waters, other than Forest Service, fiscal year 1940

Species	Eggs	Fry	Finger-lings, etc.	Total
BUREAU OF RECLAMATION				
Black bass, largemouth			634, 675	634, 675
Crappie			13, 800	13, 800
Rainbow trout			43, 000	43, 000
FARM SECURITY ADMINISTRATION				
Catfish			7, 840	7, 840
Crappie			16, 625	16, 625
Sunfish			800	800
OFFICE OF INDIAN AFFAIRS				
Black bass, largemouth			400	400
Blackspotted trout	100, 125		49, 600	149, 725
Brook trout			25, 345	25, 345
Catfish			20, 160	20, 160
Crappie			5, 280	5, 280
Rainbow trout			28, 795	28, 795
Sunfish			260	260
NATIONAL PARK SERVICE				
Black bass, largemouth		4, 000	44, 400	48, 400
Blackspotted trout	3, 516, 350	8, 342, 855	1, 600, 185	13, 459, 390
Brook trout		100, 000	411, 200	511, 200
Grayling	2, 847, 990			2, 847, 990
Rainbow trout	50, 160	376, 840	406, 905	833, 905
Sunfish			7, 320	7, 320
SOIL CONSERVATION SERVICE				
Black bass, largemouth		59, 000	31, 500	90, 500
Catfish			16, 500	16, 500
Crappie			4, 000	4, 000
TENNESSEE VALLEY AUTHORITY				
Black bass, largemouth		430, 000	22, 250	452, 250
Kentucky bass			25, 630	25, 630
Pikeperch		500, 000		500, 000
Rainbow trout			25, 000	25, 000
Rock bass			1, 520	1, 520
Sunfish			53, 000	53, 000
Miscellaneous fishes			30, 000	30, 000

ASSIGNMENTS OF FISH AND FISH EGGS TO STATES, TERRITORIES, AND FOREIGN COUNTRIES

The fish-cultural programs of 41 States were promoted by the assignment of over 69 million fish and eggs. This is in comparison with over 165 million allotted during the fiscal year 1939. The recession is explained by the fact that diversion of flounder fry to the State of Rhode Island declined from 121,455,000 in 1939 to 11,403,000 in 1940, the drop being due to small egg collections of this species at the Woods Hole (Mass.) station. There was, however, a net increase of approximately 10 million in the allotments of miscellaneous species.

Many of the fish listed in the following table were simply turned over to the States for immediate distribution, thereby relieving the Bureau of this responsibility. As heretofore, however, millions of eggs went into the State hatcheries to constitute the principal source of supply for certain varieties of trout. The States generally reciprocated by filling Federal fish applications for waters in the vicinity of their hatcheries. It will be noted that the Bureau hatched and turned over to the Maine lobster-rearing station 7,172,000 lobster fry, in comparison with 46,450 lobster fry handled in 1939.

The policy illustrated by this activity is the most concrete evidence of the fruition of the program of coordinating State and Federal fish production and distribution. The totals listed in the following table are included within the gross output of the Federal hatcheries and are therefore not to be considered as a separate category within the general summaries.

Assignments of fish and fish eggs to State fish commissions, fiscal year 1940

States and species	Eggs	Fry	Fingerlings, etc.	Total
Alabama:				
Black bass, largemouth			66, 515	66, 515
Crappie			200	200
Sunfish			289, 745	289, 745
Arizona:				
Black bass, largemouth			50, 000	50, 000
Blackspotted trout	200, 000			200, 000
Brook trout	500, 000			500, 000
Arkansas: Sunfish			7, 950	7, 950
Colorado:				
Blackspotted trout	1, 000, 200			1, 000, 200
Brook trout			7, 540	7, 540
Steelhead trout			15, 000	15, 000
Connecticut: Black bass, smallmouth		298, 000		298, 000
Florida:				
Black bass, largemouth			91, 150	91, 150
Sunfish			176, 900	176, 900
Georgia:				
Black bass:				
Largemouth			103, 600	103, 600
Smallmouth			875	875
Crappie			146, 200	146, 200
Kentucky bass			645	645
Rainbow trout	270, 000		8, 400	278, 400
Sunfish			273, 450	273, 450
Idaho:				
Black bass, smallmouth		6, 000		6, 000
Blackspotted trout	1, 580, 910			1, 580, 910
Brook trout		126, 000	306, 630	432, 630
Dolly Varden trout	43, 750			43, 750
Grayling	250, 250		15, 000	265, 250
Landlocked sockeye salmon	74, 250		119, 185	193, 435
Rainbow trout	575, 500		53, 000	628, 500
Illinois:				
Black bass:				
Largemouth			400	400
Smallmouth		50, 000		50, 000
Catfish			3, 600	3, 600
Loch Leven trout			5, 000	5, 000
Sunfish			207, 000	207, 000
Indiana:				
Brook trout			115, 200	115, 200
Loch Leven trout			98, 100	98, 100
Rainbow trout			128, 000	128, 000
Iowa:				
Black bass, largemouth			29, 850	29, 850
Brook trout			50, 000	50, 000
Crappie			4, 500	4, 500
Rainbow trout			50, 000	50, 000
Sunfish			90, 500	90, 500
Kentucky:				
Black bass:				
Largemouth		13, 650		13, 650
Smallmouth		16, 500		16, 500
Rock bass			3, 000	3, 000
Sunfish			2, 400	2, 400
Maine:				
Chinook salmon	25, 000			25, 000
Lobster		7, 172, 000		7, 172, 000
Maryland:				
Brook trout			650	650
Rainbow trout			35, 500	35, 500
Shad		3, 000, 000		3, 000, 000

Assignments of fish and fish eggs to State fish commissions, fiscal year 1940—Con.

States and species	Eggs	Fry	Finger-lings, etc.	Total
Massachusetts: Rainbow trout	50, 000			50, 000
Michigan: Rainbow trout	1, 364, 500			1, 364, 500
Minnesota: Blass bass, largemouth			48, 400	48, 400
Missouri:				
Black bass:				
Largemouth			20, 400	20, 400
Smallmouth		120, 000		120, 000
Montana:				
Black bass, largemouth			6, 050	6, 050
Blackspotted trout	2, 850, 890			2, 850, 890
Brook trout			90, 525	90, 525
Catfish			34, 615	34, 615
Crappie			23, 860	23, 860
Golden trout			100	100
Grayling			4, 500	4, 500
Loch Leven trout			127, 000	127, 000
Rainbow trout			10, 260	10, 260
Sunfish			19, 705	19, 705
Nebraska:				
Brook trout			3, 000	3, 000
Rainbow trout			4, 200	4, 200
Nevada:				
Blackspotted trout			10, 000	10, 000
Brook trout			10, 000	10, 000
Rainbow trout			10, 000	10, 000
Sunfish			3, 000	3, 000
New Hampshire:				
Brook trout	50, 000		312, 985	362, 985
Loch Leven trout			100	100
New Jersey: Rainbow trout	73, 020			73, 020
New Mexico:				
Black bass:				
Largemouth			190, 285	190, 285
Smallmouth			52, 450	52, 450
Blackspotted trout	1, 600, 340			1, 600, 340
Catfish			24, 500	24, 500
Crappie			48, 450	48, 450
Rainbow trout	622, 730			622, 730
Sunfish			322, 750	322, 750
New York:				
Brook trout			21, 150	21, 150
Rainbow trout	400, 000		10, 625	410, 625
North Carolina:				
Black bass:				
Largemouth			47, 000	47, 000
Smallmouth			1, 750	1, 750
Rainbow trout	600, 000		6, 580	606, 580
Sunfish			27, 000	27, 000
Ohio: Rainbow trout			67, 200	67, 200
Oregon:				
Blackspotted trout	2, 331, 110			2, 331, 110
Brook trout			137, 090	137, 090
Rainbow trout			58, 590	58, 590
Steelhead trout	100, 050			100, 050
Pennsylvania: Loch Leven trout			240, 000	240, 000
Rhode Island: Flatfish		11, 403, 000		11, 403, 000
South Carolina:				
Black bass, largemouth			7, 500	7, 500
Loch Leven trout			2, 975	2, 975
Rainbow trout	125, 000			125, 000
South Dakota:				
Loch Leven trout			1, 000	1. 000
Rainbow trout			10, 105	10, 105
Tennessee: Rainbow trout	75, 000			75, 000
Texas:				
Sunfish			42, 250	42, 250
Warmouth bass			3, 200	3, 200
Utah:				
Blackspotted trout	1, 500, 100			1, 500, 100
Brook trout	505, 060		24, 825	529, 885
Grayling	500, 220			500, 220
Vermont:				
Black bass:				
Largemouth			14, 550	14, 550
Smallmouth		15, 000		15, 000
Brook trout		620, 000	128, 400	748, 400
Landlocked salmon			15, 645	15, 645
Loch Leven trout			31, 800	31, 800
White perch			1, 000	1, 000

Assignments of fish and fish eggs to State fish commissions, fiscal year 1940—Con.

States and species	Eggs	Fry	Fingerlings, etc.	Total
Virginia:				
Brook trout			81, 540	81, 540
Rainbow trout			194, 850	194, 850
Sunfish			22, 475	22, 475
Yellow perch		18, 924, 000		18, 924, 000
Washington:				
Blackspotted trout	550, 300		117, 580	667, 880
Brook trout			285, 950	285, 950
Rainbow trout	460, 000		287, 485	747, 485
Sockeye salmon	100, 730		10, 000	110, 730
West Virginia:				
Brook trout			15, 245	15, 245
Loch Leven trout			30, 390	30, 390
Rainbow trout			100, 865	100, 865
Wisconsin:				
Black bass, largemouth			263, 600	263, 600
Brook trout			40, 000	40, 000
Lock Leven trout			19, 000	19, 00
Rainbow trout			32, 000	32, 000
Sunfish			600	600
Wyoming:				
Blackspotted trout	2, 500, 380		3, 000	2, 503, 380
Brook trout			19, 200	19, 200
Grayling	300, 130		10, 000	310, 130
Lock Leven trout			47, 600	47, 600
Rainbow trout			12, 400	12. 400
Total	21, 181, 420	41, 764, 150	6, 426, 835	69, 372, 405

Slightly more than 2½ million eggs of three species went into overseas shipments. The Territory of Hawaii and Puerto Rico each received rainbow-trout eggs, the species being well established in each of these areas; but with little or no natural reproduction. The shipment of lake-trout eggs to Peru was quite successful in comparison with the failure of the previous attempt. Whitefish eggs also survived the long trip but were lost during the subsequent incubation period.

An appropriation to finance such cooperative work with the American republics is highly necessary in view of the technical difficulties encountered. Such an appropriation became available for the fiscal year 1941.

Shipments of fish eggs to territories, possessions, and foreign countries, fiscal year 1940

Country and species	Number	Station from which shipped
Colombia: Rainbow trout	51, 070	Eagle Nest, N. M.
Hawaii: Rainbow trout	25, 000	Birdsview, Wash.
Peru:		
Lake trout	234, 500	Cape Vincent, N. Y.
Whitefish	2, 000, 000	Put in Bay, Ohio.
Puerto Rico: Rainbow trout	255, 200	Bourbon, Mo.
Total	2, 565, 770	

STATION OUTPUT

One hundred and four units contributed to the gross production at the Federal hatcheries during 1940. These included coooperative units and the major Forest Service nurseries, as well as the hatcheries established by statutory provision. While the Put in Bay (Ohio) station is credited with a production of whitefish and pikeperch, such a showing is made because of the fact that eggs furnished by the State of Ohio were transferred to other activities by shipment from Put in Bay. A new cooperative unit located at Mullan, Idaho, is listed in production for the first time. This complete hatchery was constructed by a local sportsmen's organization, and operating responsibility has been assumed by the Bureau.

For administrative reasons the segregation of hatcheries into main stations (numbering 53) and substations (numbering 51) was continued. Such a designation is arbitrary and does not necessarily reflect the relative importance of the different activities in terms of fish production. Several units were operated seasonally, including the Yellowstone Park Hatchery, the Weldon (N. C.) substation, and the Eagle Nest Lake (N. Mex.) egg-collecting station. An additional unit entering production was the pondfish hatchery at Inks Dam, near Burnet, Tex.

Upon completion of the present construction program only the States of Delaware, Connecticut, and Maryland will be without at least one Federal fish-cultural unit. In a number of instances the numerical output of a station was deliberately curtailed in order to permit the rearing of fish to larger size before distribution.

Stations and substations operated, and the output of each, fiscal year 1940

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Berlin, N. H.: Brook trout		249,100	351,585	600,685
St. Johnsbury, Vt.:				
Brook trout		530.000		530,000
Loch Leven trout			41,800	41,800
Landlocked salmon			15,645	15.645
Black bass, largemouth			20,300	20,300
Birdsview, Wash.:				
Blackspotted trout			152,000	152,000
Brook trout			131,500	131,500
Rainbow trout	51,000		99.775	150,775
Steelhead trout	38.500		810,000	848,500
Chinook salmon			596,290	596,290
Humpback salmon			237,000	237,000
Silver salmon			736,900	736,900
Sockeye salmon			17,645	17,645
Baker Lake, Wash.:				
Blackspotted trout			180,450	180,450
Brook trout			77,900	77,900
Rainbow trout			50,000	50,000
Mount Rainier, Wash.:				
Blackspotted trout			173,570	173,570
Brook trout			91,000	91,000
Rainbow trout			14,500	14.500
Spokane, Wash.:				
Blackspotted trout			39,980	39,980
Brook trout			88,400	88,400
Rainbow trout			267,085	267,085
Boothbay Harbor, Maine:				
Cod	1,282,103,000			1,282.103,000
Flatfish		612,900,000		612,900,000
Haddock	253,582,000			253,582,000
Pollock	1,060,000,000			1,060,000,000
Lobster	600.000	7,532,000		8,132,000
Bozeman, Mont.:				
Blackspotted trout		527,500	1,445,560	1.973,060
Brook trout			756,885	756,885
Golden trout			8,715	8,71
Loch Leven trout			127,000	127,00
Rainbow trout			601,615	601,615
Grayling			252,550	252,550
Ennis, Mont.:				
Blackspotted trout			453,050	453,050
Brook trout			72,200	72,200
Loch Leven trout			1,277,080	1,277,080
Rainbow trout			600,245	600,245
Grayling			2,695	2,695

NOTE.—Stations *italicized* are substations of the preceding station in roman type.

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Miles City, Mont.:				
Black bass, largemouth			25, 675	25, 675
Catfish			133, 075	133, 075
Crappie			94, 725	94, 725
Sunfish			83, 445	83, 445
Cape Vincent, N. Y.:				
Brook trout		224, 000		224, 000
Lake trout	299, 500	201, 000		500, 500
Loch Leven trout		86, 000	3, 970	89, 970
Rainbow trout			3, 530	3, 530
Lake herring		140, 000		140, 000
Whitefish		4, 460, 000		4, 460, 000
Black bass, smallmouth		28, 250	127, 220	155, 470
Barneveld, N. Y.:				
Brook trout			191, 750	191, 750
Loch Leven trout			31, 500	31, 500
Rainbow trout			41, 550	41, 550
Cortland, N. Y.:				
Brook trout			95, 360	95, 360
Loch Leven trout			44, 460	44, 460
Rainbow trout			20, 315	20, 315
Watertown, N. Y.:				
Brook trout			81, 295	81, 295
Loch Leven trout			94, 720	94, 720
Rainbow trout			14, 110	14, 110
Carson, Wash.:				
Blackspotted trout			282, 000	282, 000
Brook trout			292, 700	292, 700
Rainbow trout			379, 900	379, 900
Chinook salmon		932, 700	425, 200	1, 357, 900
Little White Salmon, Wash.: Chinook salmon	300, 000	11, 343, 000		11, 643, 000
Big White Salmon, Wash.:				
Brook trout			178, 000	178, 000
Rainbow trout			985, 305	985, 305
Chinook salmon	2, 000, 000	10, 522, 000	7, 620, 485	20, 142, 485
Clackamas, Oreg.:				
Blackspotted trout			11, 000	11, 000
Brook trout			154, 090	154, 090
Rainbow trout			119, 690	119, 690
Chinook salmon			346, 500	346, 500
Battle Creek, Calif.: Chinook salmon	40, 000		4, 532, 180	4, 572, 180
Butte Falls, Oreg.:				
Rainbow trout			463, 945	463, 945
Steelhead trout	100, 050		712, 620	812, 670
Chinook salmon			1, 391, 560	1, 391, 560
Silver salmon			57, 445	57, 445
Mill Creek, Calif.: Chinook salmon			1, 033, 310	1, 033, 310
Clark Fork, Idaho:				
Blackspotted trout			181, 900	181, 900
Brook trout		126, 000	417, 530	543, 530
Dolly Varden trout	43, 750			43, 750
Rainbow trout			5, 775	5, 775
Landlocked sockeye salmon	548, 950		119, 185	668, 135
Craig Brook, Maine:				
Brook trout	3, 200, 000		269, 495	3, 469, 495
Lake trout			7, 500	7, 500
White perch			1, 000	1, 000
Crawford, Nebr.:				
Blackspotted trout			980, 000	980, 000
Brook trout			281, 900	281, 900
Loch Leven trout			12, 000	12, 000
Rainbow trout			361, 300	361, 300
Black bass			21, 270	21, 270
Catfish			65, 200	65, 200
Crappie			22, 160	22, 160
Rock bass			13, 880	13, 880
Yellow perch			3, 345	3, 345
Dexter, N. Mex.:				
Black bass:				
Largemouth			238, 085	238, 085
Smallmouth			3, 200	3, 200
Catfish			24, 850	24, 850
Crappie			71, 150	71, 150
Sunfish			180, 900	180, 900
Santa Rosa, N. Mex.:				
Black bass:				
Largemouth			36, 100	36, 100
Smallmouth			49, 750	49, 750
Catfish			1, 100	1, 100
Sunfish			188, 550	188, 550

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Duluth, Minn.:				
Brook trout			696, 000	696, 000
Lake trout	300, 000	1, 572, 500	25, 000	1, 897, 500
Loch Leven trout			111, 000	111, 000
Rainbow trout			9, 000	9, 000
Lake herring		280, 000		280, 000
Pikeperch		6, 700, 000		6, 700, 000
Pike and pickerel		200, 000		200, 000
Whitefish		1, 200, 000		1, 200, 000
Edenton, N. C.:				
Black bass: Largemouth		50, 500	69, 590	120, 090
Crappie			1, 875	1, 875
Sunfish			93, 800	93, 800
Warmouth bass			13, 000	13, 000
Glut herring		170, 000		170, 000
Shad		13, 600, 000	12, 000	13, 612, 000
White perch		2, 280, 000	845	2, 280, 845
Yellow perch		1, 360, 000	535	1, 360, 535
Weldon, N. C.: Striped bass		5, 917, 000		5, 917, 000
Elephant Butte, N. Mex.:				
Black bass: Largemouth			664, 075	664, 075
Crappie			7, 200	7, 200
Sunfish			31, 000	31, 000
Erwin, Tenn.:				
Brook trout			306, 675	306, 675
Loch Leven trout			8, 100	8, 100
Rainbow trout			622, 800	622, 800
Black bass:				
Largemouth		500, 000	85, 915	585, 915
Smallmouth			1, 600	1, 600
Rock bass			14, 950	14, 950
Sunfish			75, 095	75, 095
Fairport, Iowa:				
Black bass:				
Largemouth		98, 000	93, 940	191, 940
Smallmouth			500	500
Catfish		39, 000	316, 125	355, 125
Crappie			39, 375	39, 375
Sunfish			612, 120	612, 120
White bass			245	245
Buffalofish	50, 300, 000		4, 200	50, 304. 200
Drum			200	200
Miscellaneous fishes			11, 000	11, 000
Flintville, Tenn.:				
Rainbow trout			179, 200	179, 200
Black bass:				
Largemouth			350	350
Smallmouth			405	405
Rock bass			4, 200	4, 200
Sunfish			16, 150	16, 150
Fort Belvoir, Va.:				
Black bass, largemouth			165	165
Crappie			2, 715	2, 715
Sunfish			26, 200	26, 200
Shad		27. 920. 000		27. 920. 000
Yellow perch		241, 722, 000		241, 722, 000
Glacier National Park, Mont.:				
Blackspotted trout		2, 122, 860		2, 122, 860
Rainbow trout		376, 840		376, 840
Gloucester, Mass.:				
Cod	1, 330, 965, 110	191, 980, 100		1, 522, 945, 210
Flatfish		16, 406, 280		16, 406, 280
Haddock	812, 582, 500			812, 582, 500
Pollock	902, 705, 490	174, 382, 490		1, 077, 087, 980
Lobster		552, 000		552, 000
Hagerman, Idaho:				
Blackspotted trout			243, 900	243, 900
Brook trout			102, 500	102, 500
Rainbow trout			629, 300	629, 300
Landlocked sockeye salmon			531, 400	531, 400
Salmon, Idaho:				
Blackspotted trout			104, 090	104, 090
Brook trout		2, 060	4, 500	6, 560
Golden trout			11, 140	11, 140
Rainbow trout	1, 419, 300		372, 290	1, 791, 590
Hartsville, Mass.:				
Brook trout			301, 600	301, 600
Rainbow trout			31, 165	31, 165
Black bass, smallmouth		612, 000		612, 000
Catfish			10, 840	10, 840

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
LaCrosse, Wis.:				
Brook trout			829, 410	829, 410
Lock Leven trout			266, 400	266, 400
Rainbow trout			231, 725	231, 725
Black bass, largemouth		21, 000	162, 390	183, 390
Catfish			7, 000	7, 000
Crappie			9, 520	9, 520
Sunfish			13, 700	13, 700
Yellow perch			3, 300	3, 300
Bellevue, Iowa:				
Black bass, largemouth			17, 050	17, 050
Catfish			108, 000	108, 000
Crappie			281, 000	281, 000
Sunfish			518, 000	518, 000
Buffalofish	42, 750, 000		289, 000	43, 039, 000
Miscellaneous fishes			454, 000	454, 000
Genoa, Wis.:				
Black bass:				
Largemouth			764, 575	764, 575
Smallmouth			36, 490	36, 490
Catfish			100	100
Crappie			40	40
Sunfish			5, 320	5, 320
Guttenberg, Iowa:				
Black bass, largemouth			7, 075	7, 075
Catfish			1, 726, 605	1, 726, 605
Crappie			363, 105	363, 105
Sunfish			362, 485	362, 485
White bass			22, 200	22, 200
Buffalofish	2, 822, 250		132, 600	2, 954, 850
Drum			2, 600	2, 600
Pike and pickerel	6, 782, 810	740, 140	5, 510	7, 528, 460
Pikeperch	438, 360			438, 360
Yellow perch			1, 950	1, 950
Marquette, Iowa:				
Black bass, largemouth			3, 650	3, 650
Catfish			480, 000	480, 000
Crappie			269, 000	269, 000
Sunfish			146, 620	146, 620
White bass			8, 300	8, 300
Buffalofish			11, 800	11, 800
Drum			2, 800	2, 800
Pike and pickerel			3, 400	3, 400
Yellow perch			300	300
Lake Mills, Wis.:				
Brook trout			59, 875	59, 875
Loch Leven trout			56, 500	56, 500
Rainbow trout			44, 200	44, 200
Black bass:				
Largemouth			88, 020	88, 020
Smallmouth			17, 350	17, 350
Crappie			6, 500	6, 500
Sunfish			147, 500	147, 500
Lake Park, Ga.:				
Black bass, largemouth			20, 800	20, 800
Catfish			10, 700	10, 700
Crappie			391, 100	391, 100
Sunfish			818, 900	818, 900
Lamar, Pa.:				
Brook trout			385, 130	385, 130
Loch Leven trout	10, 640		525, 740	536, 380
Rainbow trout			269, 280	269, 280
Black bass:				
Largemouth			8, 635	8, 635
Smallmouth			7, 360	7, 360
Catfish			9, 390	9, 390
Sunfish			18, 845	18, 845
Ogletown, Pa.:				
Brook trout			88, 500	88, 500
Rainbow trout			42, 300	42, 300
Las Vegas, Nev.:				
Black bass, largemouth			56, 000	56, 000
Sunfish			18, 000	18, 000
Leadville, Colo.:				
Blackspotted trout			519, 665	519, 665
Brook trout	3, 824, 560		1, 107, 465	4, 932, 025
Lake trout			21, 700	21, 700
Loch Leven trout			96, 110	96, 110
Rainbow trout			605, 170	605, 170
Steelhead trout			20, 580	20, 580
Creede, Colo.:				
Blackspotted trout			540, 300	540, 300
Brook trout	6, 078, 000		902, 900	6, 980, 900
Rainbow trout	550, 000		548, 500	1, 098, 500

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Eagle Nest, N. Mex.:				
Blackspotted trout			189,000	189,000
Rainbow trout	2,228,445		277,000	2,505,445
Leetown, W. Va.:				
Blackspotted trout			12,720	12,720
Brook trout		100	61,590	61,690
Loch Leven trout			67,700	67,700
Rainbow trout	414,055		189,380	603,435
Black bass:				
Largemouth			15,065	15,065
Smallmouth			58,560	58,560
Crappie			80	80
Sunfish			3,315	3,315
Louisville, Ky.:				
Black bass:				
Largemouth		16,650	12,420	29,070
Smallmouth		93,700	4,335	98,035
Crappie			2,360	2,360
Rock bass			17,550	17,550
Sunfish			32,625	32,625
Mammoth Spring, Ark.:				
Black bass:				
Largemouth		50,000	191,835	241,835
Smallmouth		306,000	118,325	424,325
Rock bass			23,200	23,200
Sunfish			78,100	78,100
Manchester, Iowa:				
Brook trout			191,980	191,980
Loch Leven trout			84,245	84,245
Rainbow trout	2,843,700		143,890	2,987,590
Rock bass			12,500	12,500
Marion, Ala.:				
Black bass, largemouth		27,500	505,205	532,705
Crappie			3,440	3,440
Rock bass			2,035	2,035
Sunfish			1,155,475	1,155,475
Cohutta, Ga.:				
Black bass:				
Largemouth		49,000	142,895	191,895
Smallmouth		6,800	875	7,675
Catfish			3,000	3,000
Kentucky bass		10,000	2,665	12,665
Sunfish			31,620	31,620
Lyman, Miss.:				
Black bass, largemouth			332,990	332,990
Sunfish			840,500	840,500
Marianna, Fla.:				
Black bass, largemouth		17,000	112,545	129,545
Crappie			1,300	1,300
Sunfish			320,475	320,475
Tupelo, Miss.:				
Black bass, largemouth		213,000	397,780	610,780
Sunfish			269,215	269,215
Warm Springs, Ga.:				
Black bass, largemouth		4,000	264,125	268,125
Sunfish			4,110	4,110
Mullan, Idaho:				
Blackspotted trout		20,400	297,525	317,925
Brook trout			25	25
Rainbow trout			73,000	73,000
Nashua, N. H.:				
Brook trout			158,570	158,570
Loch Leven trout			280	280
Rainbow trout			950	950
Catfish			3,000	3,000
Neosho, Mo.:				
Rainbow trout	1,729,600		77,405	1,807,005
Black bass, largemouth		9,000	15,940	24,940
Crappie			44,900	44,900
Rock bass			13,500	13,500
Sunfish			12,310	12,310
Bourbon, Mo.: Rainbow trout	3,635,000			3,635,000
Forest Park, Mo.:				
Black bass:				
Largemouth			41,125	41,125
Smallmouth			2,700	2,700
Catfish			5,850	5,850
Crappie			11,305	11,305
Sunfish			59,550	59,550
Natchitoches, La.:				
Black bass, largemouth			97,360	97,360
Catfish			875	875
Crappie			675	675
Sunfish			615,600	615,600
Warmouth bass			11,360	11,360

Stations and substations, operated and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Tishomingo, Okla.:				
Black bass, largemouth			147, 890	147, 890
Catfish			440	440
Crappie			13, 450	13, 450
Sunfish			512, 705	512, 705
Northville, Mich.:				
Brook trout			848, 570	848, 570
Loch Leven trout			100, 300	100, 300
Rainbow trout			309, 125	309, 125
Black bass:				
Largemouth			6, 415	6, 415
Smallmouth			27, 400	27, 400
Sunfish			41, 690	41, 690
Charlevoix, Mich.:				
Lake trout			160, 000	160, 000
Steelhead trout			22, 200	22, 200
Orangeburg, S. C.:				
Black bass, largemouth		17, 000	574, 110	591, 110
Catfish			23, 990	23, 990
Crappie			1, 300	1, 300
Sunfish			171, 130	171, 130
Warmouth bass			1, 685	1, 685
Yellow perch			2, 875	2, 875
Hoffman, N. C.:				
Black bass, largemouth			151, 625	151, 625
Catfish			25	25
Crappie			8, 890	8, 890
Sunfish			278, 285	278, 285
Pisgah Forest, N. C.:				
Brook trout			8, 785	8, 785
Loch Leven trout			10, 150	10, 150
Rainbow trout			21, 460	21, 460
Pittsford, Vt.:				
Brook trout	119, 000		64, 225	183, 225
Rainbow trout	94, 000		8, 650	102, 650
Put in Bay, Ohio:				
Pikeperch	940, 000	1, 250, 000		2, 190, 000
Whitefish	2, 000, 000			2, 000, 000
Quinault, Wash.:				
Rainbow trout			28, 460	28, 460
Steelhead trout			134, 155	134, 155
Chinook salmon			357, 070	357, 070
Silver salmon			90, 080	90, 080
Sockeye salmon	116, 380		2, 261, 480	2, 377, 860
Duckabush, Wash.:				
Chinook salmon			7, 280	7, 280
Chum salmon		1, 572, 000	38, 620	1, 610, 620
Humpback salmon		230, 790		230, 790
Silver salmon			100, 055	100, 055
Quilcene, Wash.:				
Blackspotted trout			89, 250	89, 250
Brook trout			52, 650	52, 650
Rainbow trout			600	600
Steelhead trout			130, 380	130, 380
Chum salmon	795, 000	2, 865, 680	90, 900	3, 751, 580
Silver salmon			509, 285	509, 285
Rochester, Ind.:				
Black bass:				
Largemouth			282, 095	282, 095
Smallmouth			20, 955	20, 955
Catfish			6, 575	6, 575
Crappie			2, 865	2, 865
Rock bass			94, 790	94, 790
Sunfish			572, 800	572, 800
Yellow perch			58, 070	58, 070
Rochester, N. Y.:				
Loch Leven trout	65, 000	15, 250	26, 395	106, 645
Lake trout			1, 940	1, 940
Rainbow trout			37, 705	37, 705
Black bass:				
Largemouth			16, 600	16, 600
Smallmouth			2, 500	2, 500
Carpenters Brook, N. Y.:				
Brook trout			175, 350	175, 350
Lake trout			15, 000	15, 000
Loch Leven trout			14, 815	14, 815
Rainbow trout			23, 940	23, 940
Saratoga, Wyo.:				
Blackspotted trout	69, 750	10, 570	502, 535	582, 855
Brook trout			117, 970	117, 970
Loch Leven trout			24, 600	24, 600
Rainbow trout			589, 285	589, 285

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Spearfish, S. Dak.:				
Blackspotted trout			130,000	130,000
Brook trout	15,000		326,510	341,510
Loch Leven trout			84,985	84,985
Rainbow trout	125,660		403,125	528,785
Springville, Utah:				
Blackspotted trout			456,600	456,600
Brook trout			210,435	210,435
Loch Leven trout			16,845	16,845
Rainbow trout	75,000		596,995	671,995
Black bass, largemouth			1,900	1,900
Sunfish			21,000	21,000
Bear Lake, Utah:				
Blackspotted trout			596,400	596,400
Brook trout			320,390	320,390
Lake trout			19,820	19,820
Rainbow trout			63,480	63,480
Chum salmon			120,680	120,680
Uvalde, Tex.:				
Black bass, largemouth		358,450	588,555	947,005
Crappie			50	50
Rio Grande perch			91,500	91,500
Sunfish			206,960	206,960
Fort Worth, Tex.:				
Black bass, largemouth			56,840	56,840
Catfish			16,375	16,375
Crappie			13,045	13,045
Sunfish			191,795	191,795
Warmouth bass			1,300	1,300
Inks Dam, Tex.:				
Black bass, largemouth			62,050	62,050
Crappie			2,925	2,925
San Angelo, Tex.:				
Black bass, largemouth			317,400	317,400
Catfish			3,600	3,600
Crappie			4,400	4,400
Sunfish			461,975	461,975
San Marcos, Tex.:				
Black bass, largemouth		284,000	202,580	486,580
Crappie			300	300
Rio Grande perch			13,160	13,160
Rock bass			5,310	5,310
Sunfish			242,065	242,065
Warmouth bass			10,200	10,200
Walhalla, S. C.:				
Brook trout		50,000	212,490	262,490
Loch Leven trout			20,000	20,000
Rainbow trout		35,000	85,885	120,885
Chattahoochee, Ga.:				
Brook trout			33,215	33,215
Rainbow trout			38,145	38,145
Franklin, N. C.:				
Brook trout			29,980	29,980
Rainbow trout			12,170	12,170
Welaka, Fla.:				
Black bass, largemouth		412,000	383,300	795,300
Sunfish			289,110	289,110
White Sulphur Springs, W. Va.:				
Brook trout			45,700	45,700
Loch Leven trout			6,120	6,120
Rainbow trout	815,000		62,025	877,025
Woods Hole, Mass.:				
Flatfish	6,607,000	132,219,000		138,826,000
Mackerel		8,277,000		8,277,000
Wytheville, Va.:				
Brook trout			349,365	349,365
Rainbow trout	1,385,000		345,650	1,730,650
Black bass:				
Largemouth			1,860	1,860
Smallmouth		19,000	6,150	25,150
Rock bass			5,550	5,550
Sunfish			6,275	6,275
Pikeperch		300,000		300,000
New Castle, Va.:				
Brook trout			22,195	22,195
Rainbow trout			53,310	53,310
Harrison Lake, Va.:				
Black bass, largemouth		327,000	8,040	335,040
Crappie			12,845	12,845
Sunfish			209,810	209,810
Shad		585,000	87,500	672,500

Stations and substations operated, and the output of each, fiscal year 1940—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Norris, Tenn.:				
Rainbow trout			12,000	12,000
Black bass, largemouth		430,000	22,250	452,250
Kentucky bass			25,630	25,630
Rock bass			1,520	1,520
Sunfish			82,800	82,800
Pikeperch		500,000		500,000
Miscellaneous fishes			32,000	32,000
Smokemont, N. C.:				
Brook trout			98,360	98,360
Rainbow trout			79,200	79,200
Yellowstone Park, Wyo.:				
Blackspotted trout	32,524,330	6,300,000	1,423,020	40,247,350
Rainbow trout	677,300			677,300
Grayling	4,349,000			4,349,000
Jackson, Wyo.:				
Blackspotted trout		382,000	224,690	606,690
Brook trout		287,500	191,000	478,500
Lake trout			13,700	13,700
Total	5,826,058,990	1,498,156,710	83,031,240	7,407,246,940

EGG COLLECTIONS

The 1940 egg collections showed a reduction in comparison with 1939 which was somewhat proportional to the reduction in hatchery output. Three marine species, cod, haddock, and flatfish, accounted for the major part of this reduction. The practice of producing trout eggs in hatcheries especially adapted to this purpose was continued, and some exchanges were effected with commercial producers. The take of brown, or Loch Leven trout eggs was increased noticeably, as the breeding stocks of this species began to attain maturity. The failure of the usual source of supply of wild brown-trout eggs several years ago forced the adoption of a policy of producing these eggs from domesticated stock. Correlation of the egg collections with the hatchery output should not be construed as an indication of mortality, since the carry-over of hatchery stock at the end of each fiscal year is a source of fish for distribution during the succeeding year.

Comparison of egg collections, fiscal years 1939 and 1940

Species	1939	1940	Species	1939	1940
Shad	48,257,000	51,759,000	Grayling	5,117,600	4,660,200
Whitefish	52,464,000	9,215,000	Pikeperch	966,755,100	10,841,400
Chinook salmon	63,124,000	46,059,100	Pike-pickerel		8,246,100
Chum salmon	11,196,100	5,418,000	Yellow perch	301,668,000	245,731,000
Silver salmon	3,080,000	1,118,700	White perch	8,300,000	4,000,000
Sockeye salmon	2,969,000	2,083,300	Cod	3,197,555,700	2,838,406,000
Landlocked sockeye salmon		481,900	Haddock	1,178,993,700	1,066,164,500
			Pollock	1,560,497,100	2,176,499,000
Humpback salmon		686,000	Flatfish	1,318,397,100	853,782,000
Atlantic salmon		113,000	Mackerel	11,060,000	9,102,000
Rainbow trout	30,155,900	33,097,900	Lake herring	5,325,000	1,245,000
Blackspotted trout	42,898,600	52,911,500	Glut herring	8,140,000	717,000
Loch Leven trout	899,500	3,043,400	Striped bass	3,143,000	8,075,000
Lake trout	2,852,000	1,079,300	Buffalofish	78,681,500	95,872,250
Brook trout	11,576,700	16,497,400	Lobster	12,991,600	8,142,500
Steelhead trout	3,386,900	2,477,900			
Dolly Varden trout		46,000	Total	8,929,774,000	7,557,571,350
Golden trout	18,200				

NOTES ON OPERATIONS

COMMERCIAL SPECIES

Pacific salmon.—The Leavenworth (Wash.) station and its auxiliaries are being developed for the expressed purpose of establishing the run of salmon from the upper Columbia River in tributary streams. The construction of the Grand Coulee Dam placed an insurmountable barrier to the runs of fish up the Columbia River to the uppermost spawning grounds. Since the Leavenworth unit was not sufficiently completed before the 1939 fall run to handle the adult salmon, the fish of this run were planted in waters that emptied into the Columbia River below the dam. The lower holding pond on Icicle Creek was completed in time to be stocked with chinook and blueback salmon from the spring run of 1940. These fish will be retained until the eggs mature and can be taken. The Bureau cooperated with the Washington Game Department by rearing rainbow-trout fingerlings which were received from the Big White Salmon station. The State supplied the labor necessary for their care, and the Bureau furnished the feed. The construction work at the Leavenworth station is approximately 50 percent complete. The hatchery building, which is equipped with 288 troughs, is complete. Work was started at the substations at Entiat and Winthrop, Wash. Congressional authority has not been secured and work was not begun on the proposed substation at Okanagan Falls, on the Okanagan River, B. C., where attention should be concentrated on the propagation of blueback salmon.

Owing to the abnormally low run of salmon, the Quinault (Wash.) station collected approximately 12 percent fewer eggs than last year. In 1933 the station initiated an experimental attempt to establish sockeye salmon runs in Falls Creek by planting large-size fingerling fish. At present quite extensive runs are established, and it is possible to obtain practically all the sockeye eggs required on or near the hatchery grounds. Not only does this result in an important saving, but the eggs are decidedly superior to those transported from distant points. Rather surprising results were obtained from a group of approximately 2,000 marked steelhead trout liberated in Falls Creek in November 1938 and March 1939. When liberated, these fish averaged about one-half pound in weight. During the spring of 1940, 42 of these trout were recovered in the traps. They were in fine condition and weighed approximately 4 pounds each. These trout were held for ripening in the dirt brood-stock pond without loss, and after they were spawned they were returned to Falls Creek. It has been exceedingly rare for steelhead trout to be taken in a trap in Falls Creek prior to this year. The entire output of chinook, silver, and sockeye salmon, steelhead, and rainbow trout were distributed in the State of Washington. The boathouse was moved to a new location.

The collection of chinook-salmon eggs at the Little White Salmon station this year was approximately 20 percent less than last year. Due to the lack of space, 300,000 eyed eggs were planted in the Little White Salmon River. No rearing pools have been constructed, so the output of fish was planted in the advanced-fry stage. The salmon flesh secured in spawning operations was frozen and placed in storage for future use as fish food by other stations. The new hatchery building under construction at the close of the fiscal year

1939 was completed, except for the necessary piping and troughs. Rocks were removed from the seining and trapping grounds on the river.

The Birdsview (Wash.) unit, in addition to collecting eggs from its brood stock of rainbow trout, took eggs from wild steelhead trout, silver, chinook, and humpback salmon. Chinook salmon, brook, rainbow, and blackspotted trout eggs were received from other stations. During the summer months the hatchery was operated at full capacity. All runs of Pacific coast salmon were considerably below normal during the past year.

The Carson (Wash.) station handled brook and rainbow trout as well as chinook salmon. The latter species was handled largely to relieve crowded conditions at the Big White Salmon unit. The brook trout contracted western gill disease, and the resultant loss was rather heavy. The total output of trout was distributed by the Forest Service in waters of the Columbia National Forest. The chinook salmon were liberated in Wind River, a tributary to the Columbia.

Chinook and silver salmon, and steelhead and rainbow trout were propagated at the Butte Falls (Oreg.) station. The station's water supply pipeline broke on July 6, necessitating the liberation of all hatchery fish in Butte Creek. While over one-half million more chinook-salmon eggs were taken this year than last, the total collection of all eggs handled was approximately one-third greater than for the previous year. In addition to the new 80-foot span of bridge constructed to support the hatchery water supply pipeline replacement, various minor repairs were made to buildings and equipment.

The collection of eggs at the Clackamas (Oreg.) station and its substations was slightly less than half the number collected last year. The shortage is attributable in part at least to unfavorable weather conditions and the extremely low percentage of female fish in the chinook salmon runs of Mill Creek and Battle Creek, Calif. The take of spring chinook-salmon eggs was approximately one-third the take of fall eggs of the same species. The collection of silver-salmon and steelhead-trout eggs was very satisfactory, and salmon, rainbow, brook, and blackspotted trout were propagated. Experiments with the use of chlorine in the water supply at Clackamas indicate that 0.35 part per million may be added without ill effects. Experiments were also conducted to ascertain the suitability of a new deep-well water supply to fish-cultural operations. The water was found to be relatively low in oxygen content, but it is believed that with proper aerating facilities it will be entirely satisfactory. A new hatchery building at the Delph Creek substation was completed.

The substation at Duckabush, Wash., collected eggs from more species of salmon than last year, although the total take of eggs was somewhat lower. Early- and late-run chum, silver, chinook, and humpback salmon were trapped and spawned, and the carcasses taken to the Quilcene dehydrating plant for processing into salmon meal. Due to limited pond area, most of the fish were planted as advanced fry in adjacent waters.

In addition to collecting chinook salmon eggs, the Big White Salmon substation handled brook and rainbow trout. This year's collection of salmon eggs exceeded all previous records. Even though eggs were transferred to other stations, it was necessary to plant a large number of the salmon as advanced fry. The remainder were fed until they were about 1½ inches in length, when part of them were liberated to relieve overcrowding, and the others were fed until they reached a length of about 2½ inches. The only major construction was the installation of a new water-supply line.

The Quilcene (Wash.) station and the Walcott Slough egg-collecting unit operated normally. Chum-salmon and steelhead-trout spawn was collected from wild fish, and cutthroat-trout eggs from the station brood stock. Blackspotted-, brook-, and rainbow-trout eggs were received from other sources. The collection of chum-salmon eggs was below normal. This shortage is attributed to the fact that the 1936 output of chum fingerlings was planted elsewhere than in the Walcott Slough. Satisfactory results were obtained with the use of apple flour as roughage in the food formula. Alder sawdust is now being tried in place of the apple pomace. Chum salmon were distributed as fry. The other species handled were held to relatively large fingerling size before they were liberated. The refrigeration plant under construction at the close of last year was completed, and meat grinding and refrigeration equipment was installed. All buildings were completely wired for electricity. The N. Y. A. gave much helpful assistance. In addition to making fry trays and office furniture for various units in the region, the N. Y. A. shop at Port Townsend overhauled and repainted all trucks and other machinery in need of mechanical repairs.

MARINE SPECIES

The Boothbay Harbor (Maine) station began collecting pollock eggs in the Portland section on November 1. The collections increased until the last of November and then declined until December 15, at which date the take did not warrant the expense of further operations. During this period 1,060,000,000 eggs were taken, fertilized, and liberated on natural spawning grounds. This was an increase of 105 percent over the preceding year. In collecting cod eggs it has been the custom in past years to place spawntakers aboard the larger commercial fishing boats during the spawning season to take ripe eggs from the catch. The Bureau's boats collected the eggs on the fishing grounds, fertilized, and planted them on spawning beds. This year the commercial fishermen moved to more distant fishing grounds, thus curtailing the Bureau's operations. Fishermen aboard the vessels were employed to take the eggs, fertilize, and plant them, and one of the Bureau's spawntakers was at hand to check the take and plantings. The method was more economical than that used in the past, but it is questionable if the eggs were of the same high quality as in previous years. The cod egg-taking season began March 22 and closed June 25. The total number of eggs collected was 1,282,103,000, which was 90.3 percent of last year's record.

Haddock operations were carried on in conjunction with codfish activities. The commercial net fishermen were paid 5 cents per quart for eggs collected and planted. The first collections were made April 4 and operations continued until June 4, during which period 253,582,000 eggs were taken. Of the 681,000,000 flounder eggs secured and incubated in the hatchery, a 90 percent hatch was obtained. During June 1940, 7,532,000 lobster eggs were hatched naturally, of which 4,842,000 were assigned to the State of Maine and 2,690,000 were planted locally. Efforts are being made by the Bureau and the State of Maine to rear more of the lobsters through the fourth stage.

Propagation of pollock, cod, haddock, flounders, and lobsters was continued at the Gloucester (Mass.) station, and hatchery operations greatly exceeded those of 1939. Offshore work varied, owing to the fishermen's strike on the larger trawlers. Increased prices prevailed on all groundfish during winter and spring, thus affording an opportunity for the smaller boats to operate. It was also possible for the gill-net fleets—the main source of egg supply for the hatcheries—to operate for a longer period. Both the quality and quantity of pollock eggs and fry handled were exceptionally high. The collection of pollock eggs for the entire season totaled 1,116,498,870, of which number 213,793,370 were incubated in the hatchery and yielded 174,382,490 fry which were liberated in suitable spots in Massachusetts Bay. Immediately after fertilization, 902,705,490 green pollock eggs were liberated in offshore work. Cod operations were carried on in conjunction with the pollock activities. Hatchery work with this species was much more extensive than in previous years. Egg collections for the entire season aggregated 1,556,302,810, and of this number 227,783,930 yielded 191,980,100 fry. In offshore work 1,330,965,110 eggs were liberated on the fishing grounds immediately after fertilization. The customary small-mesh nets were not used by the gill netters during the spring season, consequently there were no collections of haddock eggs for incubation in the hatchery. Offshore activities grossed 812,582,500 haddock eggs, which exceeds last year's take by nearly one hundred million. All liberations were made in Georges Banks. Flatfish egg-collecting operations were conducted with station fyke nets again this year. From the eggs collected 16,404,280 fry were hatched and liberated on the grounds in Gloucester outer harbor, from which the eggs were secured. Several attempts were made to obtain gravid fish from other spots around Cape Ann, but it was impossible to determine the value of these undertakings as the station did not have a sufficient number of nets to properly cover the spawning grounds. The lobster-cultural work was carried on in cooperation with the Massachusetts Department of Conservation, as heretofore. In January, 62 seed lobsters were secured from the State and 15 were collected from the gill netters. From these seeders 505,470 eggs were obtained and incubated in McDonald hatching jars, and 177,000 second- and third-stage lobsters were liberated along the Massachusetts coast from Newburyport to Boston. There were also 375,000 young lobsters liberated in July 1939 from eggs on hand at the termination of the fiscal year 1939, making the total liberations for the current year 552,000. As the station was completely rehabilitated last year under the auspices of the P. W. A. and W. P. A. projects, no major construction work was necessary. However, minor repairs were made to station buildings and equipment, both floating and automotive.

Flounder operations were begun in the Woods Hole (Mass.) area on January 3, when three fyke nets were set in Waquoit Bay. The number of nets was increased as conditions warranted until 24 nets were in use. Although a catch of only 435 suitable spawners was obtained, which is approximately one-fifth of the average take of previous years, they produced 156,378,000 eggs. From this number

132,219,000 fry, 3,684,000 eyed eggs, and 2,923,000 green eggs were planted. As the planting of flounder fry in Long Island Sound and Narragansett Bay has produced good results, a portion of the production was liberated in those waters. Most of the remainder was planted in the coastal waters of Massachusetts, and a limited number were assigned to the Rhode Island Fish and Game Commission. From commercial fishermen 9,102,000 mackerel eggs were obtained which produced 8,277,000 fry for liberation in Vineyard Sound and Buzzards Bay.

GREAT LAKES SPECIES

The role of hatcheries in maintaining the supply of commercial species in the Great Lakes is a highly debatable issue. Commercial fishermen generally advocate more hatchery activities, although their cooperation in supplying eggs is not fully satisfactory. It is pointed out, in opposition, that the decline in abundance of whitefish, lake trout, and lake herring continued during the years when hatchery activities were at their peak. There has been no clear determination of the relative efficiency of natural versus artificial reproduction in this field. It is clear, however, that the salvaging of mature eggs from fish caught during the open fishing season is a contribution to the industry, and the hatcheries operate on this basis. Also, there is evidence that the rearing of lake trout to fingerling size before planting, as is done at the Charlevoix (Mich.) station, will give more positive results.

Due to the fact that waters in which the Duluth (Minn.) station collects lake-trout and whitefish eggs were closed to fishing during the spawning season of both species, the take of these eggs was light. About 801,200 green lake-trout eggs were collected, 7,404,800 eyed eggs were received from the Michigan Department of Conservation, and 400,000 eyed eggs were obtained by transfer. The whitefish eggs taken were of poor quality and the hatch was only about 50 percent of normal. An effort was made to persuade the herring fishermen to take eggs from their catches, but little cooperation was secured. Pikeperch eggs were collected in cooperation with the Forest Service, and although the take was normal the quality of the eggs was slightly lower than for previous years. The majority of the fry were distributed in the waters of Superior National Forest. During these operations 230,000 northern-pickerel eggs were taken for experimental incubation and approximately 87 percent hatched, which demonstrates that this species can be successfully propagated artificially. Brook-, brown-, and rainbow-trout eggs were received by transfer and hatched for general distribution and for stocking the Cascade rearing ponds in Superior National Forest.

The Cape Vincent (N. Y.) station, due to a lack of funds and poor fishing weather during the height of the spawning season for lake trout, was able to secure only 278,000 eggs. When eyed, 234,500 of these eggs were shipped to Peru for the stocking of Lake Titicaca. A shipment of 300,000 lake-trout eggs was received by transfer from Duluth, Minn., to replace those sent to Peru. A total of 6,335,000 whitefish eggs were received from local fishermen, and the resultant fry were planted in Lake Ontario. The lake-herring eggs secured from commercial fishermen were few and of poor quality, but such fry as were obtained were released in Lake Ontario. The station's production of trout and pondfishes is discussed under the heading "Trout and Pondfish Stations."

ANADROMOUS SPECIES, ATLANTIC COAST

At the Fort Belvoir (Va.) unit, the take of shad eggs was substantially increased. Due to favorable water temperatures throughout the season, the hatch was 95.7 percent. The fry, with the exception of 3,000,000 which were assigned to the Conservation Commission of Maryland for planting in streams tributary to Chesapeake Bay, were planted in the Potomac River. Collection of yellow-perch eggs fell off slightly, although more than 243 million were taken. Of these, 41,124,000 were transferred to the hatchery for incubation and the remainder were placed in wire hatching baskets and incubated in natural waters. When the fry reached the free-swimming stage they escaped from the baskets. The benefits derived from planting yellow perch in suitable localities is well illustrated by the results obtained in the Wicomico River in Maryland. This river and its tributaries have been stocked with yellow perch fry annually since 1937, and a Maryland Conservation Commission inspector reports the following results: The first fish appeared in commercial quantities in 1939, when a catch of 75 barrels was reported "where none had been taken for years before." In 1940 it was reported that "as much as 3,500 pounds were caught in nets in 1 day in the upper Wicomico River * * * ."

The Edenton (N. C.) station propagated four anadromous species of the Atlantic coast. Although the cold winter and late spring caused a delay in the run of fish, and the late freezing of the rivers and Albemarle Sound destroyed so many of the stakes of the Dutch-net fishermen that new settings were necessary, slightly over 1¾ million yellow-perch eggs were collected and approximately 1⅛ million fry were produced. Because the shad run started much later than usual, the North Carolina Department of Conservation and Development extended the fishing season 5 days to compensate. This was a distinct aid to the hatchery, as the warmer water at the close of the season appreciably increased the number of ripe fish taken. The total shad-egg collection was almost double last year's, and 13,600,000 fry were planted in Albemarle Sound and its tributaries. About 200,000 fry were held in the rearing pond for continued tagging experiments. A number of tagged shad released at the Skinner's Point Fishery in May 1939 were taken within 4 miles of the point during the spring. Study is being made of reports that the shad run in Albemarle Sound all summer. More than 4,000,000 white-perch eggs were taken in Washington County, across Albemarle Sound, and the fry were planted in waters near the hatchery. When the ponds were drained for removal of pondfish, a number of white-perch fingerlings were found. These were planted in a local pond, as an experiment to study the ability of the white perch to adapt itself and propagate in landlocked waters.

The Weldon (N. C.) hatchery was operated from May 1 to May 20 for the collection and hatching of striped bass. Although runs of these fish were considered below normal, the collection was about two and one-half times greater than last year, and 5,917,000 fry were planted in Roanoke and Tar Rivers. The results of herring-egg collections were only partly successful, due to the inexperience of the spawntakers, and only 170,000 fry were liberated in local waters.

The Harrison Lake (Va.) hatchery cooperated with the Virginia Commission of Game and Inland Fisheries in setting up batteries for hatching shad on the Chickahoming River near Holdcroft, on the Pamunkey River at the Pamunkey Indian Reservation, and on the Mattaponi River at the Mattaponi Indian Reservation. All equipment for these stations was supplied by the Harrison Lake hatchery and operated by the Commission of Game and Inland Fisheries. These units produced 2,827,000 shad fry, and the Harrison Lake station produced 585,000 fry and 87,500 fingerling shad.

GAME-FISH PROPAGATION

The fact that sport fishing is growing more popular yearly is definitely indicated by an increase of approximately 6 percent in the number of fishing licenses purchased in 1938–39 over the season of 1937–38. It is estimated, including those who are not required to have licenses, that the total number of persons who enjoyed the sport of angling in 1938–39 was probably about 12,000,000. To meet this increasing demand the Bureau of Fisheries is expanding fish production as rapidly as funds permit. In addition to enlarging the existing units, several new hatcheries are being constructed in various sections. The Bureau, through the Division of Scientific Inquiry, is continually studying the environmental factors detrimental to the growth of fish. Such problems as the effects of pollution, flood and drought, and natural food supply are being investigated and programs formulated for managing game fish of the inland waters so as to benefit the largest possible number of anglers. The following reports of the year's activities at individual stations gives an accurate picture of the efforts being made to accomplish this end.

ROCKY MOUNTAIN TERRITORY

A number of new collecting fields were operated by the station at Leadville, Colo., resulting in an encouraging increase in the number of eyed eggs shipped to other stations and a slight increase in the number of fingerlings distributed. Seven species of trout were distributed. Several of the station buildings were painted, and the foreman's cottage was remodeled.

The unit at Creede, Colo., operated a new field unit for taking eggs at Electra Lake, near Durango. More than 2 million rainbow trout eggs were collected from this lake, and the total take of rainbow and brook trout eggs was more than 5¼ million. Including eggs collected, eyed, and hatched on a cooperative basis, and eggs received by transfer, this unit handled a total of approximately 15¼ million trout eggs. Much of the distribution was performed by other conservation agencies cooperating with the hatchery.

The Eagle Nest (N. Mex.) unit is operated on a seasonal basis. Due to the long winter season it is impractical to produce fish larger than the fingerling stage. Approximately 3¼ million eggs were collected from wild rainbow trout. Almost two-thirds of the eyed eggs were transferred to other stations and to the New Mexico Department of Game and Fish. The hatch of blackspotted and rainbow trout was entirely satisfactory.

In Utah the Springville unit distributed 1¼ million fingerling and adult fish. The take of rainbow-trout eggs was only about one-half the number collected last year, consequently fewer eyed eggs were shipped to other stations. Approximately 1 million rainbow-trout eggs were incubated. In addition brook, Loch Leven, and blackspotted trout were hatched and distributed. Between 45 and 50 percent of the trout produced were allotted to national forests and national parks. The limited area of the ponds restricted the production of warm-water fish to 2 species, largemouth black bass and sunfish, and 9,542 fingerlings were harvested per acre during the fall of 1940. Twenty new troughs, which were constructed last year, were installed in the hatchery.

The substation at Bear Lake, Utah, propagated four species of trout, and more than 1 million fingerlings were distributed. Blackspotted- and rainbow-trout eggs were collected from wild fish trapped in tributaries to Bear Lake. Since only one trap was operated this spring, the take of eggs was considerably less than last year. Lake- and brook-trout eggs were received by transfer, and the fingerling chum salmon which were carried over from last year were planted in the Hyrum and Pineview reservoirs.

Because of unfavorable conditions at the former Glacier Park unit, the National Park Service secured a new site near Creston, Mont. The equipment was moved to the new Glacier National Park Station and temporarily installed to enable production of fish to continue while the hatchery building and ponds were being constructed. All brook and rainbow trout hatched were held as a nucleus for future brood stock. The Bureau assumed complete charge of construction on December 1, 1939, and the work was prosecuted, under a P. W. A. grant, with W. P. A. labor. At the close of the fiscal year the cottage, utility building, hatchery building, and water-supply system were completed. The landscaping, fencing, and other minor projects, are only partially complete. In addition to the 24.5-acre brood-stock pond, 23 rearing ponds were completed and 6 are in use. It is planned to propagate blackspotted, brook, and rainbow trout, and grayling, when this station reaches full production.

Owing to an outbreak of furunculosis, all the brook trout at the Saratoga (Wyo.) station were disposed of. The water supply was treated with chlorine, followed by derris root, and there has been no evidence of the return of this disease. More than 3 million blackspotted-, brook-, Loch Leven, and rainbow-trout eggs were incubated. Four new concrete ponds 60 by 6 feet were built, posts were set, and wires were strung to keep out predatory birds. Remodeling of the superintendent's house was about 50 percent completed.

The Jackson (Wyo.) station was operated during the entire year. Blackspotted, brook, and lake trout were propagated. Since no brood stock are kept, and no wild eggs are collected, all eggs are received by transfer from other Federal and State hatcheries. The fish were distributed by the National Park Service and the Forest Service in the waters of the Grand Teton National Park, and the Teton National Forest. More than 1 million fish were distributed, and approximately one-half million fish were on hand on June 30, 1940. The C. C. C. maintained a camp at that station until December 18, 1939, under the direct supervision of the Forest Service. The personnel of the camp was engaged in various activities such as landscaping grounds, grading pond banks, and painting buildings and equipment. These additions materially increased the capacity and efficiency, and enhanced the appearance of the property.

The Las Vegas (Nev.) unit reports a substantial increase in the output, even though weather conditions were extremely unfavorable during the bass-spawning season. The recurrence of high winds and extreme temperature fluctuations caused large numbers of the bass to leave the nests after the eggs were deposited. The consequent delay in completion of spawning resulted in retarded development which postponed much of the distribution until after June 30. Sunfish production was very satisfactory. Bass production was 7,000 and bream 20,000, per acre. A shortage of water is reported, due to decreased flow of the two artesian wells.

The cooperative substation at Mullan, Idaho, received the major portion of its eggs from the Idaho Fish and Game Department. Trout began spawning much earlier in this region than last year, and better results are expected from all lots of eggs handled. Rainbow and blackspotted trout were propagated. All fish were planted in Shoshone County, in the Coeur d'Alene and St. Joe National Forests, by the Idaho Fish and Game Department in cooperation with the U. S. Forest Service and the C. C. C.

The Hagerman (Idaho) station made some changes in fish-cultural practices. Feeding formulas and methods were modified with the rainbow-trout brood stock, which resulted in a larger take of superior eggs. Although fish resulting from domestic eggs show a larger loss in the sac stage than those from wild eggs, the growth of the former is decidedly more rapid. More than 1½ million fingerlings and adults were planted during the year and there are on hand slightly more than 2¼ million fingerlings and one-half million eggs. Rainbow trout is the only species held as brood stock, but brook and blackspotted trout and sockeye salmon (landlocked) eggs were received by transfer and hatched.

The Sun Valley (Idaho) substation was operated from April 1 to May 18 for the collection of rainbow-trout eggs. A W. P. A. project included the grading of 1 mile of road to connect with the county road with 2 bridges. The W. P. A. also completed 3 new rearing ponds which have a carrying capacity of one-half million fingerling trout to the 3-inch stage. Development of a 5-acre park is about 30 percent complete.

The Salmon (Idaho) station propagated rainbow, brook, blackspotted, and golden trout. Rainbow-trout eggs were collected from Williams Lake, and the other species were received as eyed eggs. Although fewer green eggs were collected this year than last the resultant number of eyed eggs was only slightly less, since extra care exercised in the selection of spawners, fertilization, and transporting eggs to the hatchery resulted in an average of 90 percent eyed eggs as compared to an average of only 66 percent in 1939.

The Bozeman (Mont.) station had an unusually successful year. The loss of fry and fingerlings was very small and growth was excellent. The 3-year-old rainbow trout brood stock spawned to a limited extent this year. Rainbow, brook, brown, and blackspotted trout eggs received from other Federal and State hatcheries, and 300,000 eyed Montana grayling eggs were received from the Yellowstone Park station. Hatching and feeding of this species proved successful, as a total of 252,550 fingerling graylings were distributed—approximately one-seventh of which were 5 to 6 inches in length. Distribution was carried out in cooperation with the Forest Service, the National Park Service, the Indian Service, the Montana Fish and Game Commission, and private agencies.

The total output of the Ennis (Mont.) substation was approximately 2½ million, and the collection of rainbow-trout eggs was slightly greater than last season. Fry from the station brood stock were stronger and faster-growing than fry resulting from eggs collected from wild rainbow trout. There was also an increase in the take of Loch Leven trout eggs from wild fish. No Montana grayling were hatched this year, and the grayling carried over from 1939 were all planted. Many needed improvements and additions were made by W. P. A. workers. Extensive landscaping of hatchery grounds, construction of 2 ponds for brood stock, graveling of roads, construction of rock terraces, flagstone walks, and painting of buildings were the major accomplishments.

Harvesting the fingerling crop at the Miles City (Mont.) pondfish station was begun in September and completed in November. The yield was entirely satisfactory, resulting in a net increase of slightly more than 20 percent over last year. Five species of warm-water fishes were propagated. The brood stock came through the winter with practically no loss except to the channel catfish, practically all of which disappeared. Two holding ponds below Lake Garberson and a 2-acre pond were completed with W. P. A. labor. Two concrete pools were constructed on the station lawn for display purposes, and stocked with specimens.

Unsettled weather at spawning time in 1939 caused fewer fish to be carried over for fall delivery at the Dexter (N. Mex.) station. About one-ninth of the fish distributed were from 5 inches in length to legal size. Six species of warm-water fishes were propagated, with an average of 5,886 fish per acre. Two ponds were completed and an artesian well was drilled to augment the station water supply.

There was a marked increase in production at the Santa Rosa (N. Mex.) unit, but the total capacity for bass was not reached. The production of green and bluegill sunfish was slightly more than double the combined output of largemouth black bass, smallmouth black bass, and catfish. Fifteen local ponds were stocked on a cooperative basis. Quite a number of the smallmouth black bass which were introduced into this section 2 years ago have been caught recently by sportsmen. The construction of a garage and storage room was completed, a new pond was excavated, and the pond levees were riprapped at all necessary points.

The production of the Elephant Butte (N. Mex.) station was very gratifying. There was an increase in the output of approximately one-fourth million over last year. The problem of predatory bird control appears to have been satisfactorily solved by stretching wires above the pools at intervals of 25 feet. The experimental feeding of ground carp and other rough fish to bass fingerlings gave very satisfactory results. Not only do the fish make more rapid growth, but cannibalism is greatly reduced. Extensive repairs were made to the roads and dykes.

The Spearfish (S. Dak.), unit maintains brood stock of both brook and rainbow trout. This year's egg collections were below normal, due to an excessive number of barren females among the rainbow brood stock. Station records indicate that the temperature of the water supply is gradually rising. The barren females and surplus males were culled from the brood stock and released in public waters. Blackspotted and Loch Leven eggs were received by transfer. The State hatchery at Rapid City filled numerous Forest Service applications for nearby waters and the Bureau filled State applications for the stocking of waters in close proximity to the Spearfish station. Two ponds are being completely rebuilt by W. P. A. labor. The drainage channel was extended 176 feet to afford a bypass for upper ponds to avoid running all waste water through a lower series. The roadways were widened and repaired.

No brood stocks are maintained at the Spokane (Wash.), substation and no eggs were collected from wild stock. From eggs received from other hatcheries a normal output was obtained. The fish were distributed by the Washington Department of Game, chiefly in the waters of Spokane and adjacent counties.

The unit in Mount Rainier National Park collected no eggs this year, as the rainbow-trout brood stock were not sufficiently developed to spawn. Rainbow, brook, and blackspotted trout were handled. Due to the low temperatue of the water supply, very little dry feed can be used. Practically the entire production was planted by the Park Service in waters of the Mount Rainier National Park.

The seasonal substation at Baker Lake, Wash., was operated from July 1 to September 17. Blackspotted-trout eggs were received from the station in Yellowstone National Park, and an excellent hatch was secured. Brook- and rainbow-trout fingerlings were received by transfer. The Forest Service transported and planted practically the entire output within the boundaries of the Mount Baker National Forest. In addition to hatchery operations, salmon were captured and planted in Baker Lake and its tributaries. The Baker River sockeye salmon run appears to be increasing.

The output of the Clark Fork (Idaho) station was increased more than 135 percent over the production for the preceding year. Dolly Varden trout were propagated in addition to the four species previously handled. The landlocked sockeye salmon and the Dolly Varden trout eggs were taken from wild stock trapped on Bull Creek and Spring River by the Idaho Fish and Game Department. Approximately 1½ million trout and salmon were produced. The major portion of the distribution was accomplished through cooperation with the Fish and Game Department of Idaho, and the Forest Service.

NEW ENGLAND TROUT STATIONS

The Hartsville (Mass.) unit handled brook and rainbow trout and two species of pondfish during the year. The first-year spawning brook trout produced 118,700 eggs which were supplemented from other hatcheries. Rainbow-trout eggs were received from the Leetown (W. Va.) station. Smallmouth black bass fry were collected from Wangum Lake, Conn., in cooperation with the Connecticut State Board of Fisheries and Game. Adult catfish were trapped from Willetts Pond, near New Marlboro, Mass., and distributed to applicants or planted in adjacent waters. Six cooperative trout-rearing nurseries were furnished trout and periodical inspections were made of such units during the season for the purpose of furnishing technical advice to the cooperators.

Four species of trout were handled by the East Orland (Maine) hatchery. The take of green eggs from the station's brook-trout brood stock was 4,569,985, of which 3,200,000 eyed eggs were shipped to other Bureau stations. Lake-trout eggs were received from the Cape Vincent (N. Y.) station, and rainbow-trout eggs from the Neosho (Mo.) unit. Approximately 5,000 rainbow-trout fingerlings are being held for future brood stock. The State of Maine Department of Inland Fisheries and Game and the Salmon Club of Bangor cooperated in the collecting and transporting of wild Atlantic salmon to the hatchery for spawntaking. Twenty-five fish were collected, and from 11 of these 113,000 green eggs were taken. An attempt is being made to collect salmon from a fish trap installed at the up-river end of the fishway at the Bangor dam and hold them for future spawning. The trap was installed in June 1940 and a number of salmon have been taken.

Rainbow, brook, and brown trout and catfish were handled at the Nashua (N. H.) hatchery. Dry feeds were successfully used, and trout were produced much more economically. The repair of the station property which was damaged by a hurricane last year was almost completed. W. P. A. labor cut and yarded approximately 300,000 board feet of white pine logs, and slightly more than half the logs had been sawed into lumber by the close of the fiscal year. One carload of the lumber was shipped to the station at Craig Brook, Maine. There also was approximately 400 cords of wood cut from the tree tops and limbs.

Due to an infestation of furunculosis in 1939, all the brood stock at the National Forest (N. H.) station was disposed of and it was necessary to secure eggs from another source. One million brook-trout eggs were purchased from a commercial hatchery, from which a hatch of 96.9 percent was obtained. No further loss was sustained from furnunculosis, but some sac fry were lost from whitespot disease. Further loss occurred in June, due to octomitis which readily responded to treatment. Fry, fingerlings, and yearlings were distributed in the States of Maine, New Hampshire, and Vermont. There was very little expense connected with the distribution, as the fish that were not called for by applicants were distributed by fish and game departments. Under the auspices of the W. P. A., many needed repairs and improvements were made to buildings and ponds.

The fish-cultural activities of the St. Johnsbury (Vt.) unit were carried on in close cooperation with the Fish and Game Service of Vermont. Brook-trout eggs were hatched and distributed in the fry stage. The output of brook-trout fry was somewhat less than in previous years, but this was offset by the increase in the number of brown trout and landlocked salmon handled. Smallmouth black bass fry were received from the Hartsville (Mass.) station and placed in rearing ponds for subsequent distribution. The brown-trout and landlocked-salmon eggs handled were collected from wild fish by the Vermont Fish and Game Service.

The Pittsford (Vt.) station handled brook and rainbow trout. A sufficient stock of brook-trout brood fish is held to assure a minimum production of 50,000 fingerlings for distribution. Very satisfactory results are reported on the selective breeding for increased egg production. Reports on this and other investigation activities appear in the reports of the Division of Scientific Inquiry.

The Cortland (N. Y.) hatchery does not maintain a brood stock, and all eggs handled were received from other stations. Brook, brown, rainbow and lake trout were propagated, and the results obtained were gratifying. Under the auspices of the N. Y. A. and W. P. A., extensive repairs and improvements were made to buildings, roads, and grounds. Summaries of the experimental activities and scientific investigations appear elsewhere.

The Carpenters Brook unit, which is operated in cooperation with Onondaga County, collected eggs from its brood stock as follows: 100,140 brook-trout, 147,750 brown-trout, and 14,630 rainbow-trout and 199,670 brook-trout eggs, and 35,000 lake-trout eggs were received from other stations. Approximately 75 percent of the resulting fish were distributed as fingerlings, and the remainder are being held for liberation as yearlings.

COMBINATION TROUT AND PONDFISH STATIONS

No trout eggs were taken at the Lamar (Pa.) hatchery this year. Eggs received from other points produced 1,180,150 trout, and approximately 400,000 of these fish were transferred in the small fingerling stage to the Ogletown and Alleghany National Forest substations and cooperative nurseries where they are to be fed until late fall and liberated in public waters. In addition to trout, the Lamar hatchery propagated 5 species of warm-water fishes—comprising largemouth and smallmouth black bass, yellow perch, catfish, and sunfish. The aggregate output of pondfishes was 44,230 fingerlings. This unit has 15 completed ponds, each approximately 1 acre in area, and 3 under construction. Ponds were excavated and other improvements were made under the auspices of the W. P. A. and the C. C. C., and N. Y. A. employees also assisted with the general work.

The Flintville (Tenn.) station received rainbow-trout eggs from the White Sulphur Springs (W. Va.) hatchery. In addition to 179,200 3- and 4-inch fingerling rainbow trout for the stocking of Alabama, Georgia, Ohio, and Tennessee waters, 34,000 fingerlings were on hand at the end of the year. Largemouth black bass, smallmouth black bass, rock bass, and sunfish also were propagated. However, due to the small pond acreage available for the culture of warm-water species, the output of most of these forms was relatively small. Several thousand black bass and sunfish were received from the Marion (Ala.) hatchery and distributed for the stocking of central Tennessee waters. The successful artificial hatching of red-horse-sucker eggs engendered enthusiastic interest by the fishermen of this area.

The Powder Mill Park (N. Y.) hatchery, which is operated in cooperation with Monroe County, maintained a stock of adult trout from which sufficient brook-, brown-, and rainbow-trout eggs were collected to meet its needs. In addition to these three species, lake trout also were handled. This station reared practically its entire output of trout to yearling size before releasing them in the waters of Monroe County. Only 2½ acres are available for the culture of pondfishes, yet 16,600 largemouth and 2,500 smallmouth black bass fingerlings were produced.

At the Manchester (Iowa) unit 206,400 more rainbow-trout eggs were taken than last year, even though a shortage of water caused the loss of a number of brood fish before spawning. Of the 3,198,400 green eggs taken, 94 percent eyed. Only 172,000 of these eggs were held at the hatchery. The brook trout resulting from eggs received from another hatchery were infected with western gill disease and required constant treatment. Brown-trout eggs were received from the Michigan Department of Conservation. The smallmouth black bass failed to spawn normally and consequently the output was small. Arrangements have been made to secure new brood stock for next year. The rock bass produced a normal crop. The area for the production of pondfish is very limited, only 2.13 acres being available.

At the Leetown (W. Va.) station a total of 1,363,600 rainbow-trout eggs and 270,600 brown trout eggs were taken. The low hatch of trout eggs was attributable to dietary deficiency. During the year 189,380 rainbow trout, 61,690 brook trout, and 67,700 brown trout were distributed, and 32,370 trout of 6 inches or more in length were furnished to the George Washington National Forest. Approximately 58,560 smallmouth black bass were distributed direct to applicants or transferred to Wytheville and New Castle, Va., for supplying applicants in these sections. Artificial feeding of smallmouth black bass was carried on in 8 of the new ponds. These fish exceeded the growth of bass produced on natural food; in some cases by several inches. Experiments with blackhead minnows as forage fish showed that the production of smallmouth fingerling bass was in reverse proportion to the number of adult forage minnows used.

The Lake Mills (Wis.) station is not equipped to maintain a stock of brood trout. Brook-, brown-, and rainbow-trout eggs were received from other hatcheries and the resultant fish were distributed in waters of Wisconsin, Michigan, and northern Illinois. This station has a pond area of 29 acres, with 35 ponds available for the production of warm-water fishes. Largemouth and smallmouth black bass, crappie, and sunfish were propagated. There were approximately 8,940 pondfish produced per acre, or a total output of 259,370 fingerlings.

The Northville (Mich.) hatchery produced both trout and pondfishes, in addition to supervising the propagation of lake trout and steelhead trout at the Charlevoix substation and the rearing of trout at cooperative nurseries in the Marquette National Forest (Sullivan Creek), Huron National Forest (Pine River), Clare County, and the Fontinalis Club. The trout were transferred from the Northville Station to the nurseries by Fisheries Car No. 9 during the early part of May. Rainbow- and brook-trout eggs were received from other Bureau stations while the brown-trout eggs were supplied by the Michigan Department of Conservation. In addition to the trout work, three species of pondfishes were propagated. About 27,400 smallmouth black bass, 6,415 largemouth black bass, and 41,690 sunfish fingerlings were distributed. These fish were produced in 4.8 acres of water, which is the total acreage available for the culture of warm-water fishes.

The take of rainbow-trout eggs at the Neosho (Mo.) unit was slightly less than for the last year because approximately 1,000 2-year-old females failed to reach maturity. Selective breeding was practiced, and no eggs were retained to hatch for brood stock except from females producing approximately 1,300 eggs per pound of fish, which eyed 90 percent or more. Trout eggs were shipped to a number of Bureau stations. The number of warm-water fishes produced was limited by the small amount of available pond area (6.776 acres). Due to unseasonable weather which previled during the spawning season, the bass production was unusually small. The schools of bass fry apparently broke up much younger this year than usual because of high winds during the hatching season. The total output of all sizes of bass for the year was 24,940.

The cooperative substation at Bourbon, Mo., materially increased its production of rainbow-trout eggs, and 91 percent of the green eggs taken were eyed.

The production of trout from the Cape Vincent (N. Y.) station and its auxiliaries at Cortland, Watertown, and Barneveld, was approximately 1¼ million, several thousand of which were of legal size. The activities with pondfish were confined entirely to the propagation of smallmouth black bass, with an output of this species in excess of 150,000 fingerlings—an increase of more than 60 percent over last year's production.

APPALACHIAN AND BLUE RIDGE TROUT STATIONS

The Pisgah Forest (N. C.) station, which is located on the Davidson River in the Pisgah Forest and operated in cooperation with the Forest Service, liberated its production in waters within the Federal area in which it is located. The various waters were stocked in accordance with a program formulated on data collected from stream surveys made by the Division of Scientific Inquiry. It was very difficult to hold the trout over the winter, as the temperature of the water remained at 32° F. for several days, causing as much as 6 inches of ice to form on the ponds during a single night.

The Smokemont (N. C.) hatchery, which is located in the Great Smoky Mountains National Park, reported a production of 177,560 brook and rainbow trout ranging in length from 3 to 6 inches. These trout were utilized in restocking waters of the Great Smoky Mountains National Park and the Cherokee Indian Reservation. The present water-supply system at Smokemont is unsatisfactory for fish-cultural purposes and the National Park Service has under consideration the construction of an open flume, or raceway to replace the present metallic underground pipe. In the meantime, it is the intention to incubate some trout eggs during the coming season at the Walhalla (S. C.) hatchery, and transfer the resulting fish to Smokemont when they are approximately 1 inch long.

The output of rainbow, brook, and brown trout at the Walhalla hatchery was in excess of 400,000. While 52,445 of these fish were assigned directly to the Forest Service, 231,000 were transferred to the Nantahala and Chattahoochee National Forest rearing units where they were held until fall before being liberated in the streams of those two public areas. At the end of the year, approximately 500,000 fingerling trout of the three species handled were on hand at Walhalla.

The majority of the fish produced in all of the trout hatcheries and rearing units in this area are now being planted according to a carefully planned program. Game-fish management is undergoing a broad-scale trial in this region where the fishing pressure is relatively intense. The results to date have emphasized a dependence upon hatcheries and the necessity for rearing the fish to legal size.

PONDFISH STATIONS

Probably a larger percentage of sportsmen are dependent upon the warm-water fishes for recreation than upon any other group. Increasing temperatures of the inland streams, due to deforestation, decreased flowage of water, etc., have rendered many which formerly produced cold-water fishes too warm for their continued survival. The stocking of such waters has placed an additional drain upon the production of pondfish hatcheries. To produce fish for these waters, as well as newly created ponds, lakes, and reservoirs, the Bureau is adding new units in various sections of the country and increasing the size of existing hatcheries as rapidly as funds for such operations are provided. Although progress is being made in the study of artificial feeding of pondfishes, no artificial ration has been found that successfully supplants the natural diet. Therefore, the production of pondfishes is still largely dependent upon the area of the ponds available, which ponds must synthesize a supply of food sufficient for their growth to the desired size. Supplementing the natural food production to a certain degree has helped to meet the problem.

The Fairport (Iowa) hatchery conducted its fish-cultural activities along routine lines, and attained normal success in the production and distribution of six species of spiny-rayed fishes. Buffalo-fish eggs amounting to 50,300,000, obtained from commercial fishermen operating along the Mississippi River in the vicinity of the station, were fertilized and returned to the spawning grounds. Very little salvage work was necessary along the Mississippi River, but since this unit is properly equipped to handle such operations it cooperated with local sportsmen and the Iowa Conservation Department in transferring game fish and pan fish from stagnant inland waters to suitable nearby waters.

Due to adverse weather conditions during the spawning season, the production of largemouth black bass at the Rochester (Ind.) station was far below that of last season. Nevertheless, the total output of the eight species of warm-water fishes handled at this hatchery and its auxiliary at Argos was in excess of 1 million fingerlings. This station was favored with a W. P. A. project which made possible regrading several pond bottoms and banks, riprapping approximately 16,000 square feet of creek bank, landscaping grounds, and excavating a 5-acre pond. Cattle manure was used for fertilizer, and the production of daphnia for fish food was quite successful; especially during the early spring months. The nine flowing wells—the source of water supply at the Argos unit—were cleaned, thus increasing the flow of all wells except one by approximately 50 percent.

The Senecaville (Ohio) substation was opened on May 7 and shortly thereafter 74,000 advanced black bass fry were transferred from Rochester to that point for stocking the rearing ponds.

Although the Welaka (Fla.) station has not been placed on a full productive basis, the output of black bass and bream for the year was in excess of 1 million—this production being the largest since the station has been under the jurisdiction of the Bureau. Approximately

460,000 of the output were assigned to the Ocala National Forest for restocking waters in that public area. Improvements were made to the station under the auspices of the W. P. A. as follows: Completed drainage system for the series of 24 one-acre ponds; installed 30-inch drain in Beecher holding lake; regraded bottoms of ponds, including Beecher holding lake; removed obsolete water system; installed laboratory heating system; and numerous minor repairs to buildings.

Compared with last year's total output at the Uvalde (Tex.) unit, there was a total reduction of 13 percent, with an increase of approximately 26 percent in the production of largemouth black bass. These differences were due to an emphasis on bass production which resulted in tripling the output of this species in comparison with other varieties. Approximately 1⅓ million fish were distributed, including 206,700 fingerling sunfish and 91,400 Rio Grande perch. In addition to the above, a total of 480 adult brood stock were assigned to the new unit at Inks Dam, Burnet, Tex. The extremely unfavorable weather conditions prevalent at many of the hatcheries during the spawning season of the bass was not experienced at Uvalde.

The production of the two species propagated at the Burnet hatchery was entirely satisfactory. The year's yield of largemouth black bass was 19,390 per acre of water, and the production of crappie was 3,655 per acre. A total of 64,975 fingerling fish were produced. Construction and painting of all station buildings, including residence, garage, office, and bachelor quarters, shop-garage, and fish-holding house were completed. The grading and landscaping of the building area was completed and water lines for sprinkling were installed. The hatchery grounds were enclosed with a woven wire fence and cattle guards were constructed at the more important entrances. Although all 14 ponds are completed, a number remain to be treated to reduce seepage.

Owing to intensive daphnia culture and artificial feeding, the San Marcos (Tex.) unit was able to effect a substantial increase in the production of fingerling fish; even though the pond area of approximately 12½ acres was not increased. Two or more species are produced in each of a number of the ponds. The maximum per-acre production of fingerling fish at this hatchery was achieved with bream, at 80,000, followed by largemouth black bass at 51,000.

The San Angelo (Tex.) station, which has a pond area of 45 acres, produced more than 787,000 black bass, sunfish, channel catfish, and crappie, all of fingerling size. No major construction work was prosecuted, but minor repairs were made to buildings and ponds.

The program to enlarge the pond system at the Fort Worth (Tex.) station was continued during the year. This unit now has 20 ponds embracing a total area of approximately 35 acres. From the ponds that could be used more than 279,000 fingerling black bass, warmouth bass, crappie, bream, and channel catfish were collected and distributed. The production of channel catfish, which is one of the more difficult species of warm-water fishes to handle artificially, was very gratifying.

Minor repairs necessary to the maintenance and operation of the station were made at the Tishomingo (Okla.) hatchery. Five species of pondfishes were handled, comprising largemouth black bass, bluegill sunfish, green sunfish, crappie, and catfish. The local demand for panfish is much greater than for other species. An average of 17,000 fingerling fish per acre of water accounted for a total production of slightly less than 700,000 fish. Bream are propagated in conjunction with bass and crappie. The control of predatory animals and birds presents one of the major problems at this station.

New major construction projects were not undertaken at the Marion (Ala.) station during the year. Holding house No. 2, however, which was under construction at the close of last year, was completed and equipped with an electric pump for filling distribution receptacles, and a gasoline pumping unit was installed in holding house No. 1 to assist in areating the water in the holding tanks and to facilitate the filling of distribution pails. All buildings were wired for electric current. Adverse weather conditions during the height of the bass spawning season greatly reduced the production of that species. Although the total output was below last year's, a production of approximately 5,000 fingerlings per acre of water was obtained. The production of bream was not noticeably affected by the unfavorable weather. Breeding stocks of both largemouth black bass and bream were supplied to the units at Elkmont, Ala., Cohutta and Warm Springs, Ga., and Tupelo, Miss. As usual, the Alabama Department of Conservation and the Georgia Department of Natural Resources assisted in the transportation of fish for the stocking of waters in their respective areas. The cooperation of these departments kept the expense of distribution to a minimum, thereby enabling the station to expend its funds for fish production.

The Carbon Hill (Ala.) station was incomplete at the end of the year. Seven of the fourteen ponds originally planned have been finished and four more are approximately 50 percent completed. Two wells were drilled to supply water for the ponds and domestic use. This unit is being constructed largely under the auspices of W. P. A.

There was no construction or repairs to station buildings at Tupelo, Miss., during the year. The subzero weather experienced during the winter caused the loss of approximately 1,200 of the station's bream brood stock, and these fish were replaced with adult bream from the Marion (Ala.) hatchery. All ponds are stocked with both bass and bream and the results obtained from this type of propagation have been very satisfactory, as is proved by a production of 35,693 fingerling largemouth black bass and 15,836 fingerling bream per acre; a total output of 51,529 fingerlings per acre of water.

The Lyman (Miss.) station distributed a total of 332,990 fingerling bass and 840,500 fingerling bream for the stocking of Mississippi and Louisiana waters. The cost of production at this station is very low, due to an abundance of natural food. The fresh-water shrimp which were planted as forage in 1938 and 1939 are apparently increasing, even in the brood-stock holding pond. Nocturnal insects, attracted by lights which have been placed near the surface of the water, are a promising source of auxiliary food for fingerling bass. Shrimp heads, a local waste product, are secured free of cost and are proving very satisfactory as a pond fertilizer. Construction at this unit was largely limited to repairing and general conditioning of levees, roads, and fences. An all-weather road around the ponds was constructed by treating the main levee roads with oystershells. Giant bamboo and bamboo cane were planted to serve as windbreaks for the ponds, and black locust, kudsu, honeysuckle, and wisteria were planted at needed points for erosion control.

The Cohutta (Ga.) station produced five species of pondfishes this season; namely, largemouth and smallmouth black bass, Kentucky bass, bream, and catfish. A total of 65,800 fry and 181,055 fingerlings were distributed. As both bass and bream are stocked in the same ponds, no statistics are available for separate production. No new ponds were constructed at this station, but the bottoms of ponds Nos. 1, 2, 3, and 5 were graded to give the proper slope for drainage. The holding shed and the spring house were wired for electricity.

In view of the extensive construction work in progress at the Warm Springs (Ga.) unit, a number of the ponds could not be used. From those available, however, approximately 273,000 largemouth black bass and bream were produced, which were largely distributed by the Department of National Resources of Georgia. In addition to excavating a fish-exhibit pool of approximately one-third acre, and a rearing pond of the same size, extensive changes were made in the pond system. A number of the ponds were subgraded and the bottoms of two were completely reversed as to grade. New dikes were built and existing ones were raised and widened. Seventeen concrete outlets with necessary drain lines of terra cotta pipe were installed. A new fish-holding shed 29 ft. 6 in. by 25 ft. 6 in. was constructed. Cottage No. 2 was remodeled, and two toilets were installed in the office building. Considerable filling and landscaping around the station buildings was accomplished.

At the Lake Park (Ga.) hatchery the unusually warm weather in November and December caused the bream and crappie to continue spawning until December 15. As a result, the production was increased almost three-fold. The cost of production is very low, due to an abundance of natural food, and very little handling of brood stock or young. As has been the practice for a number of years, the State of Georgia distributed most of the fish produced. About 1,142,140 fish were distributed to applicants or planted in Georgia waters, and 99,360 were delivered for the stocking of Florida waters.

The Elk River (Ala.) hatchery, constructed by the T. V. A. primarily for the stocking of waters under its control, was taken under operating jurisdiction of the Bureau. Due to the necessity of treating the ponds with clay and bentonite to retard seepage, no fish were propagated. Brood stocks were collected for stocking the ponds when treatment is completed.

The hatchery at Norris, Tenn., was originally built for the purpose of propagating fish for stocking Norris Lake. However, production has increased to the point where Hiawassee and Chickamauga Lakes, of the T. V. A. system, also are being stocked. Because of the availability of C. C. C. labor, only one Bureau employee is stationed here. To preclude the introduction of foreign diseases or parasites into Norris Lake, all brood stock for the hatchery is collected locally. Crappie were propagated for the first time this year. The 500,000 pikeperch fry resulting from 580,000 eggs received from the Put in Pay (Ohio) station were planted in Hiawassee and Chickamauga Lakes.

The Louisville (Ky.) unit continued the practice of propagating five species of warm-water fish; smallmouth black bass, largemouth black bass, rock bass, crappie, and sunfish. In addition to these species, blackhead minnows and golden shiners were propagated as forage food for the fish. Due to adverse weather conditions during the spawning season, the output of bass fry was far below normal. Enough fry were obtained, however, to stock the rearing ponds and assign several thousand to the State of Kentucky for its rearing units. The two ponds under construction at the close of the fiscal year 1939 were completed.

The Harrison Lake (Va.) unit propagated three species of pondfishes in addition to its shad operations; largemouth black bass, bream, and crappie, with normal production. Enough daphnia were produced to furnish an ample supply of food for the bass fry.

At the Marianna (Fla.) station the majority of the ponds were drained earlier than usual in order to treat them with bentonite in an endeavor to decrease the loss of water through seepage. Cold weather occurring during the bass spawning season caused an abnormal loss of eggs, thereby curtailing the production of bass. The output of bream and crappie was normal, since they did not spawn until after the cold weather. Two crops of bream are produced here each year and two crops of largemouth black bass are possible. This station produced 21,597 largemouth bass and 50,070 bream per acre. An abundance of daphnia and natural food was produced in the rearing ponds by fertilization with from 500 to 1,000 pounds stable manure per acre during the season.

In addition to the work necessary for the maintenance of the hatchery property, three new ponds of 2 acres each were constructed at the Natchitoches (La.) station, and excavation was begun on a fourth pond. Due to unusual fluctuations in water temperatures in the ponds at spawning time, the largemouth black bass hatch was only about 50 percent of normal. It also is probable that the crappie production was similarly curtailed, since they began spawning about the same time as the bass. Due to the brevity of the experiment and the cold weather during spawning season this spring, no definite conclusions can be reached on the attempt to rear gizzard shad as forage for the bass. Notwithstanding the adverse conditions, 725,870 fingerlings were distributed during the year for the stocking of Louisiana, Texas, and Arkansas waters.

Even though the Mammoth Spring (Ark.) station produced a record output of smallmouth black bass last year, the production for the current year shows a gain of approximately 10 percent for this species, and an average output of the other spiny-rayed fish handled. Minnows and crayfish constituted the chief food for the brood stock, and daphnia was cultured for the fry and small fingerlings. The conservation departments of Arkansas, Missouri, Illinois, and Idaho received smallmouth black bass fry from this unit. The Arkansas Game and Fish Commission aided materially with the distribution of fish within that State. The fuel house and garage floor were repaired; the fuel house, residence, and pump house were painted; and the tank house was reroofed.

Four species of pondfish were propagated at the Edenton (N. C.) unit. Sunfish stocked with the largemouth black bass furnished forage for the young bass and sufficient fingerlings to supply the local requirements. Although the crappie production was somewhat below last year's, the total number of pondfish was about 15 percent above the 1939 output. Daphnia were cultured as food for the small fish. In addition to pondfish, yellow perch, white perch, shad, striped bass, and herring were propagated. This work is discussed under the heading "Anadromous Species, Atlantic Coast."

The Valley City (N. Dak.) hatchery, which is under construction, was sufficiently complete to stock five species of warm-water fishes in the brood ponds. Due to adverse conditions, the production of largemouth bass fry was light. Bream and crappie were still spawning at the close of the fiscal year. Pike, pickerel, and pikeperch fry were secured from the State of North Dakota and placed in rearing ponds for fall distribution. The construction work is practically complete. A holding house 30 by 30 feet, a pump house 10 by 14 feet, and 9 pond-outlet kettles and gates were completed during the year in addition to grading, riprapping, and seeding dikes.

Owing to a shortage of water in the early fall of 1939, the Orangeburg (S. C.) hatchery lost many of its breeders and a large number of young fish. Consequently, the production for the fiscal year of 1940 was approximately 21 percent less than for 1939, although it was above the yearly average. The total ouptut was 792,090 fish, which is a production of 29,067 per acre. Shad were not handled at the Jacksonboro (S. C.) shad hatchery this year because the eggs were not obtainable on a salvage basis.

The number of fish produced this year at the Hoffman (N. C.) station was only 60 percent of last year's production, due largely to the fact that this station has adopted the policy of distributing larger fish. This station has 23 one-acre ponds completed and four under construction. Two of the new ponds are complete except for the outlet boxes and the other two are approximately 80 percent excavated. Facilities for drainage of grounds and ponds were improved, and minor repairs were made to the buildings. The barn was razed and the lumber stored for future use. Pine straw was used to cover the bottoms of two nursery ponds to a depth of a few inches, wheat straw was used on another, and a fourth was covered with broomsedge sod. The ponds thus treated produced more fish of a uniform size than those that were fertilized with cottonseed meal alone.

UPPER MISSISSIPPI RIVER WILDLIFE AND FISH REFUGE

Owing to completion of the system of flood-control dams along the Mississippi River, and the 9-foot navigation channel, fish-rescue work has been reduced to a small fraction of its former importance. There is a continuing need for rescue work, however, as management of the storage pools causes certain areas to be flooded, and pools remain which will trap some fish. Only 4,333,535 fish were rescued this year. All species indigenous to the Mississippi River were represented in these collections, but catfish comprised one-third of the total. Rescue work was carried on at Marquette, Guttenberg, Bellevue, and Fairport, Iowa. No rescue work was done by the Genoa (Wis.) station or the Homer (Minn.) unit.

Three large ponds were in production at the Guttenberg station, which produced a total of 1,260,170 fingerling and adult fish. More than 1 million of these were catfish. In addition to the pondfishes, buffalofish and northern pike were incubated in the hatchery. High water delayed the construction work on some of the ponds at Guttenberg. However, three ponds were partially completed and can be placed in production in the near future.

The La Crosse (Wis.) station is the headquarters for all the upper Mississippi River fisheries and rescue work. In addition to these activities, trout and pondfishes are propagated and many cooperative nurseries in Wisconsin, Minnesota, and Illinois are supervised. In Minnesota there was a total of 12 cooperative ponds with 8 sponsoring units, and in Wisconsin a total of 44 ponds, representing 29 separate agencies. A high percentage of fish delivered to each agency in the spring are planted each fall. Both the Northside station at La Crosse and the auxiliary unit at Lynxville were used during the spring to relieve congested conditions at the La Crosse hatchery. The hatchery pond at La Crosse produced 162,390 fingerling largemouth black bass (37,188 per acre).

Because of a cold wave following warm spawning weather, the year's production of largemouth black bass eggs in pond No. 1 (about 35 acres in area) at the Genoa (Wis.) station was practically a total loss. Consequently, only a few early deliveries of fingerlings were made. Fry produced in other ponds were transferred to pond No. 1 for rearing and subsequent distribution. Three additional ponds with a total area of approximately 12 acres were stocked with smallmouth black bass, one 4-acre pond was stocked with sunfish, and another pond with crappie. Three new ponds having an area of approximately four acres each were constructed during the year. They complete the system of ponds north of the Bad Axe River. Extensive changes were made in two older ponds.

The personnel of the Homer (Minn.) unit was engaged in general repair work for all stations in the central district. Portable equipment such as nets, seines, rowboats, small engines and motors, and standard forms for concrete and cement work were constructed or repaired. Both efficiency and economy result from such a practice when the work is sufficient to require full-time service of the mechanics, as is now the case.

Number and disposition of fish rescued, fiscal year 1940

Locality and species	Delivered to applicants	Restored to original waters	Total number of fish
All stations:			
Black bass	5, 600	21, 450	27, 050
Crappie	7, 490	866, 425	873, 915
Sunfish	71, 915	999, 500	1, 071, 415
Catfish		1, 496, 360	1, 496, 360
Yellow perch		2, 200	2, 200
Pike-pickerel		8, 250	8, 250
Buffalofish		356, 600	356, 600
White bass		27, 745	27, 745
Drum		5, 000	5, 000
Miscellaneous fishes		465, 000	465, 000
Total	85, 005	4, 248, 530	4, 333, 535
Summary by stations:			
Marquette, Iowa	30, 620	903, 300	933, 920
Guttenberg, Iowa	38, 185	1, 290, 935	1, 329, 120
Bellevue, Iowa	16, 200	1, 650, 850	1, 667, 050
Fairport, Iowa		403, 445	403, 445
Total	85, 005	4, 248, 530	4, 333, 535

AQUARIUM

While no major changes in equipment or operations were effected in the Aquarium during the year, the periodical acquisition of new specimens stimulated a continuing public interest in the displays. As usual most of the exhibit fishes were obtained from the Bureau's hatcheries, and a carload shipment was received from the Mississippi River during the late fall.

A new type of illuminated colored sign was installed on some of the tanks. Due to the frequent changing of exhibits it is necessary to develop some sort of sign which will be readily interchangeable. Shad eggs and trout eggs from local hatcheries, and salmon eggs from the West coast were shown under incubation in the miniature demonstration hatchery. An average of about 1,500 specimens, including the small fingerlings which are reared at the aquarium, were on display daily during the year. Shipments of rare golden trout, and of lake trout in the fingerling stage were received.

It may be pointed out that the Aquarium in the Department of Commerce Building is not the only public aquarium operated by the Bureau. At Woods Hole, Mass., and Boothbay Harbor, Maine, salt-water fish were shown during the summer months. At La Crosse and Lake Mills, Wis., Louisville, Ky., and Welaka, Fla., a considerable number of fresh-water species were exhibited. All fish hatcheries are in the nature of aquaria, since the public is enabled to view live fish at any period of the year, and the plans for some of the new hatchery developments include special tanks for display purposes.

DISTRIBUTION OPERATIONS

Requests for allotments of fish to restock waters were received from individuals and sportsmen's organizations in greater numbers this year than for several previous years—the total being 13,146. This number does not include applications received from the Forest Service, National Park Service, and other Federal agencies, which requests were given priority.

The trend is constantly toward the use of trucks for distribution work, especially for trips within a radius of approximately 300 miles of the hatchery. At the present time fish cars are used only for the longer hauls. During the year fish-delivery trucks traveled a total of 367,985 miles. This figure does not include travel by trucks owned by State conservation departments, national forests and parks, etc., which were used to assist in distributing the production of Federal hatcheries.

Fish-distribution cars, which were engaged in delivering fish to applicants and transferring fish between hatcheries, made 57 trips this year and carried an average of 260 pails per trip. The cars traveled 32,048 paid miles and 12,344 free miles. Detached messengers traveled 50,325 paid miles and 7,263 free miles in delivering fish to applicants. As usual, the Bureau received either free transportation or reduced rates from a number of the railroads.

Decentralizing the distribution service by establishing a field office at La Crosse, Wis., has greatly expedited distribution activities, especially in the Central States. As soon as funds become available, it is the expectation to decentralize the distribution service further by placing experienced employees at various central points. This will not only facilitate the handling of distribution, but will enable the Bureau to work in closer cooperation with the State conservation departments and at the same time reduce distribution costs.

Summary, by States, of the distribution of fish, fiscal year 1940

State and species	Number
Alabama:	
Largemouth black bass	482,315
Smallmouth black bass	125
Crappie	3,140
Rainbow trout	9,600
Rock bass	2,935
Sunfish	805,585
Arizona: Largemouth black bass	50,000
Arkansas:	
Largemouth black bass	142,375
Smallmouth black bass	101,125
Catfish	70
Rainbow trout	2,250
Rock bass	21,500
Sunfish	148,200
California: Chinook Salmon	5,565,490
Colorado:	
Largemouth black bass	5,710
Blackspotted trout	1,139,820
Brook trout	1,710,280
Catfish	8,400
Crappie	5,040
Lake trout	21,700
Loch Leven trout	90,885
Rainbow trout	1,078,605
Rock bass	8,700
Steelhead trout	20,580
Sunfish	8,400
Connecticut:	
Smallmouth black bass	303,000
Brook trout	70,000
Rainbow trout	1,000
Delaware: Largemouth black bass	330
Florida:	
Largemouth black bass	926,495
Smallmouth black bass	1,250
Catfish	500
Crappie	39,300
Sunfish	640,285
Georgia:	
Largemouth black bass	473,680
Smallmouth black bass	7,675
Brook trout	60,740
Catfish	14,420
Crappie	361,200
Kentucky bass	12,140
Rainbow trout	58,025
Sunfish	921,615
Idaho:	
Largemouth black bass	400
Smallmouth black bass	6,000
Blackspotted trout	1,028,810
Brook trout	572,635
Golden trout	11,140
Grayling	51,000
Landlocked sockeye salmon	650,590
Rainbow trout	1,007,915
Sunfish	125
Illinois:	
Largemouth black bass	40,650
Smallmouth black bass	60,600
Brook trout	1,200
Buffalofish	324,000
Catfish	133,900
Crappie	286,200
Loch Leven trout	20,900
Miscellaneous fishes	454,000
Sunfish	747,150
Indiana:	
Largemouth black bass	181,130
Smallmouth black bass	21,955
Brook trout	151,700
Catfish	5,450
Crappie	2,865
Loch Leven trout	174,600
Rainbow trout	159,015
Rock bass	92,250
Sunfish	428,100
Yellow perch	53,070
Iowa:	
Largemouth black bass	198,415
Smallmouth black bass	5,840
Brook trout	53,800
Buffalofish	148,400
Catfish	2,485,425
Crappie	649,480
Drum	6,600
Loch Leven trout	5,645
Miscellaneous fishes	11,000
Pike and pickerel	748,915
Rainbow trout	80,790
Rock bass	3,000
Sunfish	813,375
White bass	30,745
Yellow perch	2,250
Kansas:	
Largemouth black bass	12,800
Catfish	945
Crappie	19,075
Rainbow trout	2,700
Sunfish	4,225
Kentucky:	
Largemouth black bass	38,910
Smallmouth black bass	96,785
Crappie	2,360
Loch Leven trout	300
Rock bass	12,350
Sunfish	24,125
Yellow perch	420
Louisiana:	
Largemouth black bass	132,700
Catfish	520
Crappie	675
Sunfish	477,300
Warmouth bass	11,360
Maine:	
Smallmouth black bass	70,000
Brook trout	284,915
Flounder	612,900,000
Lake trout	7,500
Lobster	7,532,000
Rainbow trout	100
Maryland:	
Largemouth black bass	6,530
Smallmouth black bass	1,340
Brook trout	3,340
Crappie	800
Loch Leven trout	9,000
Rainbow trout	40,795
Shad	27,920,000
Sunfish	10,825
Yellow perch	4,260,000
Massachusetts:	
Smallmouth black bass	105,575
Brook trout	204,020
Catfish	12,440
Cod	191,980,105
Flatfish	63,556,285
Lobster	552,000
Loch Leven trout	280
Mackerel	8,277,000
Pollock	174,382,605
Rainbow trout	27,795
Michigan:	
Largemouth black bass	35,965
Smallmouth black bass	20,165
Brook trout	403,445
Crappie	400
Lake trout	1,381,500
Loch Leven trout	2,500
Rainbow trout	86,610
Rock bass	195
Steelhead trout	22,200
Sunfish	80,415
Whitefish	1,200,000
Yellow perch	2,500

• *Summary, by States, of the distribution of fish, fiscal year 1940*—Continued

State and species	Number
Minnesota:	
Largemouth black bass	168,875
Smallmouth black bass	7,200
Brook trout	740,250
Crappie	8,240
Lake herring	280,000
Lake trout	376,000
Loch Leven trout	152,500
Pikeperch	6,950,000
Pike and pickerel	200,000
Rainbow trout	96,025
Sunfish	24,680
Mississippi:	
Lakemouth black bass	835,450
Catfish	7,000
Crappie	300
Sunfish	1,155,035
Missouri:	
Largemouth black bass	196,545
Smallmouth black bass	209,700
Catfish	8,130
Crappie	45,505
Rainbow trout	74,780
Rock bass	15,200
Sunfish	87,620
Montana:	
Largemouth black bass	6,550
Blackspotted trout	4,033,065
Brook trout	835,395
Catfish	90,090
Crappie	45,825
Golden trout	8,715
Grayling	194,250
Loch Leven trout	1,404,480
Rainbow trout	1,243,705
Sunfish	6,935
Nebraska:	
Largemouth black bass	7,900
Brook trout	55,675
Catfish	24,400
Crappie	12,020
Loch Leven trout	12,000
Rainbow trout	219,970
Sunfish	29,475
Yellow perch	2,100
Nevada:	
Largemouth black bass	56,000
Blackspotted trout	57,000
Brook trout	25,000
Rainbow trout	199,225
Sunfish	18,000
New Hampshire:	
Smallmouth black bass	6,000
Brook trout	289,360
Catfish	1,400
Rainbow trout	600
New Jersey:	
Largemouth black bass	6,445
Smallmouth black bass	400
Catfish	300
Crappie	240
Sunfish	3,700
Yellow perch	470
New Mexico:	
Largemouth black bass	869,455
Smallmouth black bass	52,950
Blackspotted trout	189,000
Catfish	26,750
Crappie	82,850
Rainbow trout	241,500
Sunfish	397,450
New York:	
Largemouth black bass	21,020
Smallmouth black bass	212,175
Brook trout	437,640
Catfish	1,800
Crappie	1,590
Flounder	73,666,000
Lake herring	140,000
Lake trout	202,940
Loch Leven trout	202,335
New York—Continued.	
Rainbow trout	110,720
Rock bass	2,000
Sunfish	2,800
Whitefish	4,460,000
Yellow perch	1,800
North Carolina:	
Largemouth black bass	677,890
Smallmouth black bass	2,750
Brook trout	177,765
Catfish	25
Crappie	10,765
Glut herring	170,000
Loch Leven trout	9,910
Pikeperch	225,000
Rainbow trout	140,920
Shad	13,150,000
Striped bass	5,917,000
Sunfish	404,925
Warmouth bass	13,000
White perch	2,280,845
Yellow perch	1,222,535
North Dakota:	
Largemouth black bass	1,150
Catfish	6,120
Crappie	4,320
Loch Leven trout	16,000
Rainbow trout	4,000
Sunfish	1,300
Ohio:	
Largemouth black bass	70,010
Smallmouth black bass	740
Brook trout	7,500
Catfish	1,320
Loch Leven trout	23,000
Pikeperch	1,250,000
Rainbow trout	76,100
Rock bass	10,650
Sunfish	147,660
Oklahoma:	
Largemouth black bass	135,520
Catfish	520
Crappie	11,050
Rainbow trout	375
Sunfish	506,505
Oregon:	
Brook trout	154,090
Chinook salmon	1,738,060
Rainbow trout	641,135
Silver salmon	57,445
Steelhead trout	712,625
Pennsylvania:	
Largemouth black bass	10,520
Smallmouth black bass	7,320
Brook trout	431,045
Catfish	7,890
Loch Leven trout	398,150
Rainbow trout	238,895
Sunfish	18,215
Yellow perch	180
Rhode Island: Flatfish	11,403,000
South Carolina:	
Largemouth black bass	594,515
Brook trout	49,945
Catfish	23,400
Crappie	1,300
Loch Leven trout	2,975
Rainbow trout	47,835
Sunfish	215,855
Warmouth bass	1,645
Yellow perch	2,880
South Dakota:	
Largemouth black bass	6,925
Blackspotted trout	64,000
Brook trout	321,010
Catfish	35,300
Crappie	26,560
Loch Leven trout	19,985
Rainbow trout	251,820
Sunfish	28,955

Summary, by States, of the distribution of fish, fiscal year 1940—Continued

State and species	Number
Tennessee:	
Largemouth black bass	735, 605
Smallmouth black bass	290
Brook trout	36, 020
Kentucky bass	26, 150
Loch Leven trout	2, 340
Miscellaneous fishes	2, 000
Pikeperch	275, 000
Rainbow trout	743, 895
Rock bass	19, 770
Sunfish	188, 425
Texas:	
Largemouth black bass	1, 902, 570
Catfish	16, 255
Crappie	32, 110
Loch Leven trout	5, 225
Rio Grande perch	96, 310
Rock bass	5, 310
Sunfish	1, 201, 515
Warmouth bass	11, 500
Utah:	
Largemouth black bass	1, 500
Blackspotted trout	1, 066, 120
Brook trout	386, 025
Chum salmon	120, 680
Lake trout	19, 825
Loch Leven trout	16, 845
Rainbow trout	486, 250
Sunfish	21, 000
Vermont:	
Largemouth black bass	20, 300
Smallmouth black bass	50, 000
Brook trout	916, 525
Landlocked salmon	15, 645
Loch Leven trout	42, 140
Rainbow trout	8, 310
White perch	1, 000
Virginia:	
Largemouth black bass	349, 840
Smallmouth black bass	51, 505
Brook trout	200, 265
Crappie	14, 680
Pikeperch	300, 000
Rainbow trout	293, 260
Rock bass	5, 550
Shad	672, 500
Virginia—Continued.	
Sunfish	244, 670
Yellow perch	237, 600, 000
Washington:	
Largemouth black bass	6, 000
Blackspotted trout	845, 780
Brook trout	905, 250
Chinook salmon	31, 803, 275
Chum salmon	4, 567, 200
Crappie	7, 200
Humpback salmon	467, 790
Rainbow trout	950, 105
Silver salmon	1, 436, 325
Sockeye salmon	2, 279, 125
Steelhead trout	1, 074, 535
West Virginia:	
Largemouth black bass	14, 755
Smallmouth black bass	23, 805
Blackspotted trout	11, 590
Brook trout	25, 120
Catfish	1, 125
Crappie	80
Loch Leven trout	35, 735
Rainbow trout	163, 365
Sunfish	8, 910
Wisconsin:	
Largemouth black bass	781, 260
Smallmouth black bass	40, 800
Brook trout	834, 440
Catfish	8, 015
Crappie	12, 200
Loch Leven trout	288, 800
Rainbow trout	238, 250
Sunfish	137, 900
Wyoming:	
Largemouth black bass	7, 085
Blackspotted trout	10, 092, 580
Brook trout	863, 790
Catfish	38, 000
Crappie	4, 860
Grayling	2, 857, 990
Lake trout	13, 700
Loch Leven trout	73, 600
Rainbow trout	1, 131, 505
Rock bass	5, 180
Sunfish	13, 400
Yellow perch	1, 245